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THE FOUNDRY

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Mold-Drying Apparatus.

BY S. GROVES.

"THERE is nothing new under the sun." This ancient saying was recalled to my memory recently, as I stood in one of the largest foundries in the country, watching the experiments of two German engineers with a portable wind-heating apparatus for drying molds, cores, etc., which is said to be patented. A vision passed before my eyes of an extensive pipe foundry and blast furnace plant, covering 26 acres, employing over 1,000 men, and located on the rugged northeast coast of England, in sight of the German ocean. Powerful steamships laden with gas and water pipes were leaving the wharves and ploughing their way across the sea to Amsterdam, Dantzig, Hamburg, and other continental ports, from whence the pipes were to be carried by rail to the great cities of Holland, Austria and Germany. Cochrane was a name to juggle with in the European capitals, and German engineers visiting England never failed to visit the immense foundries and furnaces at Ormesby Iron Works, Middlesborough. As far back as 20 years ago I can remember escorting deputation after deputation of inquisitive, spectacled foreign visitors through the large foundries and jobbing shops. There was one appliance connected to each of the fifteen pipe pits which was always a source of interest to "mein Herr," namely: a mold-drying system identical in principle with the patented wind heating apparatus, which is traveling through the northern States just now, and since this ancient device of the Old World may be advantageously adapted to the conditions of modern American foundry practice, I propose to give the readers of THE FOUNDRY a few brief notes thereon.

The patented device referred to, is constructed something like this:

It consists of an oblong wrought-iron box Fig. 1, lined throughout with fire brick and has two chambers within, separated by a partition wall marked A. The chamber B is charged with a coke fire, into which cold blast from the cupola main is blown. This cold blast having absorbed the heat from the coke fire, is carried over the partition wall into chamber C, down through the outlet pipe D, into the mold. The wind pressure—suited to different molds—is regulated by the valve marked E, the fire is fed through the opening marked F, and the refuse is withdrawn through doors at the sides of chamber B. The inlet pipe G, is fitted with flexible hose connected to the blast main, which is provided with branches at suitable locations along the sides of the foundry. The entire apparatus which is of no great weight, is carried by crane to all parts of the foundry, and the outlet pipe D, is inserted into the riser hole or suitable aperture in the cope, which is separated from the drag about 6 inches, and bricks are placed around the opening about ½ an inch apart to allow for the outlet of vapor from the mold. Both parts of mold are thus dried simultaneously. I have seen the entire mold of a 5′–0″ fly wheel dried in 4½ hours with a consumption of only five riddles of coke and one to start up the fire.

Having described the Hansen patented wind heating apparatus, I now proceed to set forth the ancient Ormesby device, as applied to the drying of vertical pipe molds, etc., for the last twenty years.

In the larger foundries the apparatus was located inside the building near each pit, as per Figs. 2 and 3.

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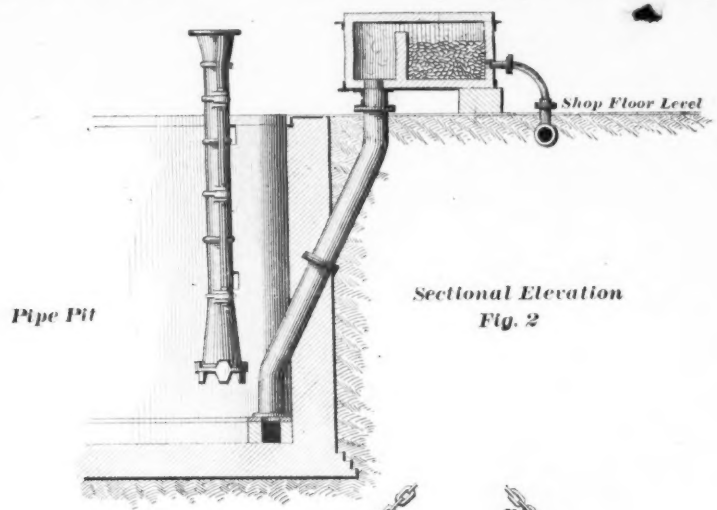
The wind heating apparatus shown in Figs. 2 and 3 is somewhat different in shape to the Hansen patent, but the advancement is precisely similar. When it is remembered that as many as a dozen 4″ pipe molds are dried at one time, the advantage of making one end of the box larger than the other will be manifest, seeing it gives increased fire space, with no useless space in the hot air chamber. While the application of two cold-blast inlets instead of one, is also an advantage, since it spreads the cold wind over a greater area of the fire. In the smaller foundries the wind heating box is located outside the building, thus giving increased floor space around the pit and at the same time decreasing the excessive heat of the foundry. This admirable apparatus for mold-drying was in successful operation at the time I left England, in March, 1890, where it



Sectional Elevation
Fig. 2

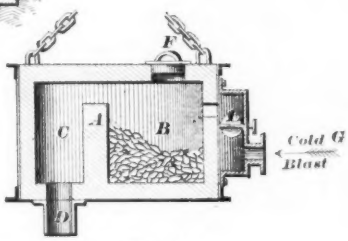
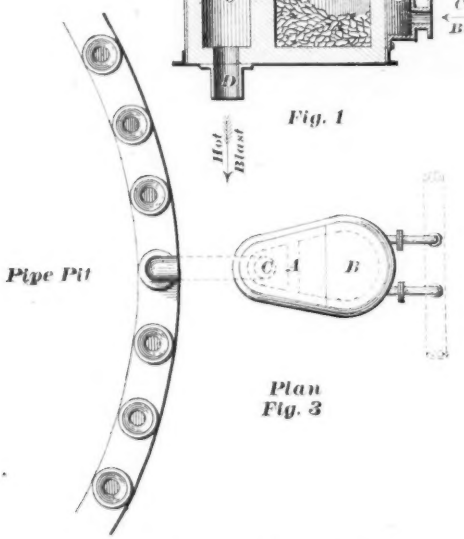


Fig. 1



Plan
Fig. 3

Mould Drying Apparatus
The Foundry

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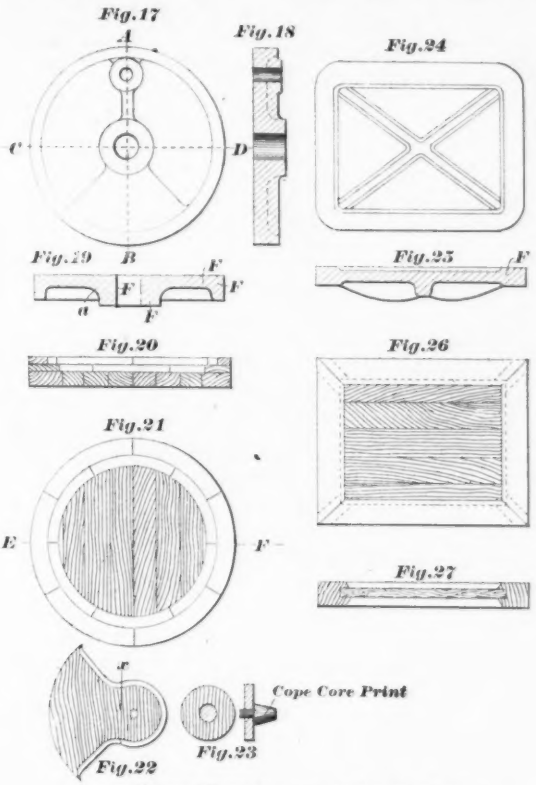
had been in vogue for many years. It superseded the primitive enveloping box,and in the order of things progressive, will be displaced by the improved gas producer circuit system, which is cleaner, simpler and more economical.

In a subsequent paper, I propose to describe in detail this latter plan, which after twenty-two years' experience in pipe foundry design and practice, I hesitate not to pronounce the best system of fixed or portable mold-drying known in the modern iron founders' art.



Steam Chest Cover and Crank Disc.
The Foundry

Lessons in Patternmaking for Manual Training Schools.

BY P. S. DINGEY.

II.

CRANK DISC.

FIGURES 17, 18 and 19 are three views of a crank disc with counter balance, Fig. 18 being a section through AB, and Fig 19 through CD. Parts of the pattern and manner of construction are shown in Figs. 20 to 23, Fig. 20 representing section of pattern through EF. It will be seen that the plate of pattern is built with narrow strips, which in this case should not be glued at the joints—the two courses of segments on the outside, six in each course, will hold this plate together. After having laid up the courses of segments on the plate, allow them to dry before turning, while the counterbalance, hub and crank pin boss are being made. The hub, it will be noticed by section in Fig. 18, projects, but when turning it, make it the same thickness as counterbalance. The hub being turned, saw a part of it off, as shown in Fig. 22. This is a much better way than fitting the counterbalance around the hub—the projecting piece with core print in Fig. 23, will cover and bind the joint X. The fillet A, on the hub in Fig. 19 joins the one on the counterbalance in Fig. 22, the latter be-

ing carved out and not nailed in as it sometimes is. When fitting these parts to the inside of disc care should be taken to locate them, so that the grain of the wood runs the same as that in the plate, thus allowing the parts to shrink uniformly.

The disc should now be turned, and in doing so let the diameter be enough smaller on the plain side for draft, thus enabling the pattern to be easily drawn out without breaking the mold. In Fig. 19 the hub is shown down, and the face of the disc up, but the pattern is not molded nor the casting cast this way, for the reason that the casting is required to be free from scum and dirt on the face when turned, which would not be so if cast face up, and therefore the draft on the periphery should be as indicated. Do not forget to allow stock for turning and boring, where the letter F appears.

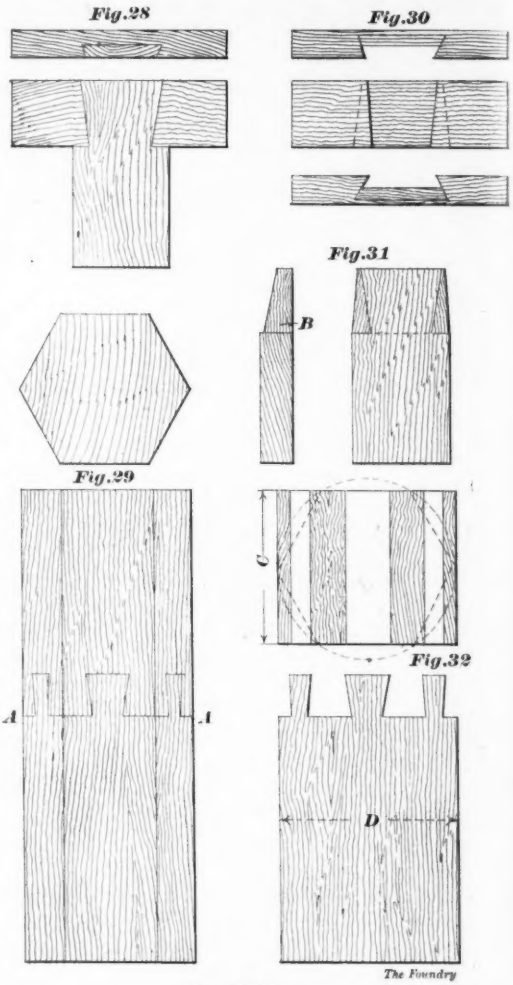
STEAM CHEST COVER.

A steam chest cover for a slide-valve engine is shown in Figs. 24 and 25, of which Fig. 25 is a sectional view. The cover is strengthened by cross ribs in order to withstand the steam pressure to which it may be subjected.

This is a very simple casting to make a pattern for, and there is a number of ways in which the pattern can be made. If we want to make it quickly to get but one casting from it, just a square piece of board with ribs, and pieces on the outer edge nailed on, would answer the purpose, but the above method would not be good enough for a pattern in frequent use, because it would probably split and warp out of shape. For a pattern that would not be so liable to such evils it is better to adopt the plan in Figs. 26 and 27, though there be much more work in the making. Fig. 27 is a section of the pattern. The center part is made after the same manner as plate in disc pattern. The five strips of wood fit into a groove made in an outer frame surrounding them. It will be noticed that this outer frame is mitred at the corners, and the dotted lines show that a tongue is inserted at each corner, in the manner given in examples of joining corners in article 1, Fig. 13.

The pattern is molded and the casting poured in the same way as the crank disc, with the side marked F down, or as the molders say, in the drag. On this side, stock must be allowed for planing the casting.

After rounding the four corners make the cross ribs by getting out two pieces and half check them together at the center. Let these ribs be doweled on to the cover, so that they may be taken off, to allow the molder to lay the pattern flat on a board at the first ramming.



Dovetailing

DOVETAILING.

The two exercises in dovetailing given in Figs. 28 and 29, are not very common

in practice, but they form an interesting study and a puzzle to many people.

Looking at the two views in Fig. 28, a person is very apt to wonder and begin to speculate as to the way the two pieces forming a T go together, for being dovetailed both ways, it appears to be an impossibility. Fig. 29 is no less deceiving where two hexagon blocks are represented to be joined together by dovetails.

Figs. 30 and 31 reveal the secret of Fig. 28, and Fig. 22 that of Fig. 29. The dovetail in Fig. 31 being made thicker at B than at the end, is what allows it to slide into place. Different views of the two parts fully explain the way to cut them, and will no doubt interest the student. There does not seem to be much advantage in this way of dovetailing, over the ordinary one in Article I, Fig. 15, except that it is stronger at the shoulder B.

Owing to the outline of the two side dovetails in Fig. 29 being a projected view, or foreshortened, the seeming impossibility here does not show so clearly in the drawing as it will in the two hexagon pieces themselves, when made and put together. The center dovetail in Fig. 32 is larger than the two side ones, but when the corners of the square block are planed off on the angle of hexagon, represented by dotted lines in end view, each dovetail will then appear to be the same size, and if a good fit is made it will be difficalt for anyone to know which is the large dovetail.

If different kinds of wood be used, say one of cherry, another of maple, and so on, this hexagon stick will make an interesting specimen of woodwork. In preparing the pieces to be joined they should be first planed square on the sides, and a little full to whatever sizes C and D may be, for after the parts are dovetailed together, the stock will likely need dressing off a second time in order to get it straight before making it hexagon shape.

The writer did some dovetailing about 20 years ago, like the two examples given, and remembers very well the amusement it gave him when someone who did not know the "trick," would begin guessing as to the way the pieces were made.

The Feeding Rod.

H. HANSEN

"IT shrank," is a remark often heard in the foundry and machine shop, and if the above expression is made about a casting that is required to be solid, the last judgment has been passed upon it, and it is forthwith conveyed to the scrap heap, where the molder who made it would find food for thought if he would spend as much time to discover the cause of his failure to furnish a solid casting as he does to tell his partner about the pedigree of some prize fighter.

It is all very nice to have castings smooth and clean, but it is far more important, all in all, that they should be solid. A scab can be chipped off without affecting the strength of the casting, but filling up a shrink hole after the casting is once solid, does not return to it the strength it would have had if proper feeding had been done.

We can hardly say that unsound castings are the result of carelessness, for while as molders we may be a pretty tough crowd, still, I have never seen the one yet who wanted his work to be lost. It should rather be credited to insufficient knowledge on the subject of feeding, or like in many other things, a lack of time to consider all the points connected with same, when a casting is lost on this account.

The use of too small feeding heads is one of the chief causes of the trouble. A lot of molders think that by using these, they don't disfigure their work as much as by using larger ones. While I am willing to admit that it does not improve the looks of a casting to have a big part of it chipped over, still we should be on the safe side. It is not right to use a feeder 2″ in diameter, when we should employ a 3″. The saying that an inch don't make much difference, doesn't apply here. A gate 2″ in diameter contains an area a little over 3⅛ square inches, while one 3″ has a surface of nearly 7 1-16 square inches or more than double.

When we increase the size of our

feeding heads, we also increase our chances for obtaining a solid casting. It is the small feeders that we are unable to keep open. I know a lot of castings only need to have a solid appearance to make them acceptable, and in this case molders can be forgiven for only feeding them enough to make them stand up, but if we do not know what a casting is to be used for or has to withstand, we should keep to the right and feed it solid, even if in doing so, we have to leave a good-sized spot to be chipped over.

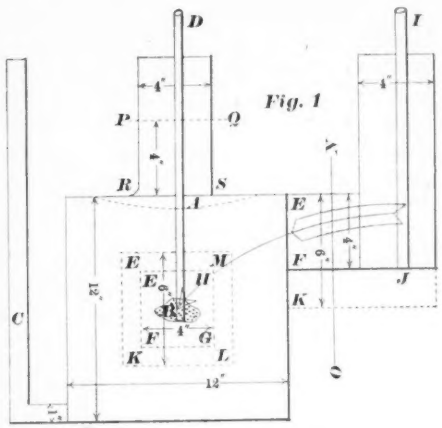


Fig. 1

Fig. 6

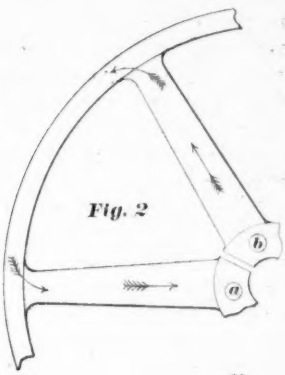


Fig. 2

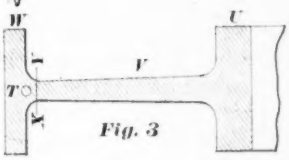


Fig. 3

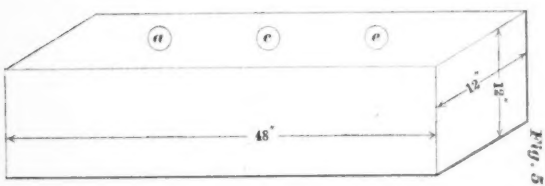
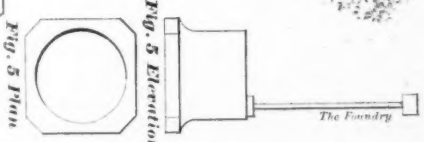


Fig. 4



To avoid the placing of feeding heads on conspicuous parts of castings, some molders resort to indirect feeding. The difference between direct and indirect feeding is, that in the first we enter the casting with our feeding rod, but not so in the latter case, where the shrinkage of the metal is supplied through a side gate. I will illustrate these two different ways of feeding by Fig. 1, and I think it will be found worthy of investigation to carry this subject a little further and inquire into the respective merits of each and how they perform the work for which they are intended. Fig. 1 represents a cube, having sides of 12". This casting contains one cubic foot, and to produce it solid, some feeding will be required.

If it is not fed at all and no feeding head placed anywhere upon it, we would very likely find the casting sagging down, as shown by the dotted line A, and also find a porous portion somewhere near the center, as shown at B. The cause of the shrinkage thus being found in two places, will become apparent when we consider that the metal, after filling the mold, immediately starts to shrink; first, because of its contact with the mold, which cools it, and second, it is also cooling off and becoming solid gradually since leaving the cupola. As it shrinks, it draws upon the highest part for feed as long as that part remains fluid. Thus it will be seen that the part shown by the line A, supplied the shrinkage until that part became solid. A part below this, being still in the liquid state, of course shrank after the upper crust had become solid, and drawing its feed from the highest point

of fluid iron, left the space at B hollow.

The rapidity with which the shrinkage of iron takes place depends on many conditions, such as kind of iron, temperature of melted iron, the amount of iron in a body, the amount of surface exposed, etc., but I will confine myself, in comparing direct and indirect feeding, to the latter.

As shown in Fig. 1 at C, the running gate of this casting is 1″ square. If we have no feeders the casting will be fed by this gate as long as it remains in a fluid condition, but owing to the great amount of surface exposed, compared with the body of metal, this gate will quickly become solid, when the casting must draw its feed from within itself, as before illustrated at A and B.

We will next place a feeder 4″ square on the top of the casting, and it will be seen that by it we are enabled to keep an open channel with feeding rod D, as deep as is required for the introduction of any metal the casting may need in its shrinkage.

Transferring this same 4″ feeder to the side and making it an indirect by cutting an inlet in the gate 4″ square to the casting from the feeder, puts a new aspect on the case. That I may more readily impress on the mind of the reader the difference that exists between the two, I have divided the original cube with sides of 12″ into two additional cubes, having sides of 6″ and 4″ respectively, for comparison later on.

This 4″ inlet on the side will occupy a space on the casting equal to the square EFGH. Now, as our feeding rod I, can only go as far as J, any metal which we supply the casting must enter through this space of its own accord, and it follows that it will only do so as long as this channel remains fluid. We have no way of keeping it open, for we cannot reach it with our feeding rod in the direction of the arrow. How long this channel will remain fluid can be approximately estimated by comparing the amount of surface exposed as against the body of metal contained. The reader will readily see that the inlet EFGH, being a cube with sides of 4″ will be solid a long time before the casting, a cube with sides of 12″. After this inlet is solid we can do all the pumping we want to in the feeder, but it has no effect on the casting.

Increasing the size of inlet to a cube having sides of 6″, we do the opposite of what the advocates of these indirect feeders claim—we increase the size of the mark we leave on the casting more than double, but I want to illustrate it this way and give it a fair trial.

A section of this 6″ inlet on the line NO, gives us the square EKLM. Compare a cube of this size with the casting it is supposed to feed, and judge for yourself which will cool the quickest. The feeder should be open till the casting is fed solid, but if we adopt this indirect system of feeding it will be seen that the feeder will be the first to freeze up (unless we make the inlet the full size of the part to be fed), for the simple reason that we are unable to reach it and keep it open with the feeding rod.

If we can feed this casting from the side, as shown, we will also be able to feed it from the top, without letting our feeding line extend further than the line PQ. Anyone having done much feeding knows that the rod must enter the casting to be of any service, still of the two modes just mentioned, one will have as much effect as the other, since there can be no difference in result between keeping the feeding rod 4″ away from the side or the same distance from the top of casting, other things being equal.

The question of putting a fillet on a feeding head, as at R, or leaving it straight, as at S, must be left to the judgment of the molder. For absolute safety the fillet is to be preferred, but on a large number of castings a great amount of chipping could be avoided by leaving the fillet off, when the chances for the head breaking off square are favorable, thus saving considerable labor and time in the dressing of the casting.

Sometimes the head in being knocked off will take a small part of the casting with it, and in cases where this will injure the casting, the precaution of using a fillet will insure against this happening at the expense of having to do more chipping.

The way some molders have of filling

feeding heads on castings that take a long time to become solid, full of borings, is a plan that can not be approved, unless fluid metal can not be obtained. When in this way we can in most cases give the casting the appearance of being solid. The hottest metal should be found in the feeding head, but when borings are introduced through it to the casting it will be found that the metal in the feeder is cooled off more by this course than the metal in the casting. The strength of the casting is also affected by this treatment, and if any machine work is to be performed on the part where these borings have found their way, it will likely be noticed that the casting shows a flaky appearance, caused by the fluid metal refusing to assimilate the cold metal forced upon it.

The purpose for which we use the feeding rod is also misunderstood by many. Its office is simply to keep an open channel to that portion of a casting which we wish to supply with metal. We can not force the iron or rather compress it by the use of the feeding rod; if we could, there would be no trouble about feeding solid.

To see some molder feeding a casting and making about 90 strokes per minute, one would think that he was operating some kind of a force pump, which delivered a certain amount of metal into the casting at each stroke, but this is a delusion.

To the end of further showing that the view I take of non-efficience of side feeders is correct, I will call attention to Fig. 3, showing a section of a wheel. I have watched a good many of these being broken up, and in nearly every case they have been porous at the intersection of the arm and rim T. Such wheels are fed solid at the hub V, but this does not make the point T solid. It is another case of indirect feeding that fails to do its work. We will call the hub U the feeding head, the arm V the feeding gate, and the rim W the casting. Now, the feeding of the hub will only supply the shrinkage at T as long as the arm V remains fluid at its smallest part X, Y.

We will carry this further to Fig. 2, showing part of a wheel having the hub split, but not the rim. Each part of the hub will need a separate feeder to insure its being solid. If this indirect feeding was a success we should be able to supply the shrinkage at *a*, through the arm and rim from *b* in the direction shown by arrows.

There is also a limit to the efficiency of a single feeder, like a lightning rod, it is only effective within certain bounds. This differs under different circumstances, but Fig. 4 may be taken as an example. Here we have a rectangular piece, 12″x12″ at the ends, and 48″ long. If we place a feeder at the center *c*, we will have 24″ to feed each way. While it is true that we are able to reach the central portion with our rod, still I doubt whether in this case a single feeder is sufficient. I am afraid that this piece would be found porous below the places *d*, *e*. In feeding, like everything else we do in the foundry, we should be on the safe side, and in actual practice better results would be obtained in this case by using two feeders at *d* and *e*.

Fig. 5 shows a way of procuring a solid face that is practiced in some shops on shoes and dies for stamp mills. They weigh from 50 to 200 lbs. each, and are made of hard iron, which makes it extremely difficult to perform any chipping. To avoid this, they are poured direct from the top, and as soon as the gate is set, the cope is lifted off and removes the gate with it. A smooth butt of a rammer is then employed to "rub it down," an operation which consists chiefly in keeping the cooling metal level. It takes a bit of practice to be a successful "rubber," and it is doubtful if this way of feeding(?) would be resorted to but for the fact that it does away with all chipping, an expensive item on hard iron.

Another way of accomplishing the same object, and employed in the same shops, is illustrated at Fig. 6. It consists of an extra piece shown at *f*, which is molded in the cope portion with the regular pattern. It corresponds in size to the amount of metal it is calculated that the casting will absorb in shrinking. Thus if it is thought that the casting will need 5 lbs. That will be the weight

of this extra piece, so that if everything works as intended, the casting consumes all of this metal, and leaves a face nearly level and solid.

I said "as intended," for it is at best a very uncertain proceeding. Taking it for granted that the right mixture of metal is obtained, of which the percentage of shrinkage is known, it will also be required to be poured at a certain temperature. If too hot, the casting will shrink below its intended face and leave a hole. If on the dull side, a lump will be left to attest that it had more feed than it wanted. The reader will readily see how difficult it is to pour a lot of castings of this kind at just the same temperature, and unless this be done the result will be unsatisfactory.

Returning to the subject of feeding, I don't want to be understood as condemning indirect feeding. When we are unable to reach part of a casting in any other way, it is better than nothing at all, but I have tried to show in the foregoing that direct feeding is worthy of preference, if we intend to produce solid castings.

Notice that a large number of molders seemingly believe that anything a feeding rod can be shoved into is a feeder, has caused me to write this article with the intention of showing that feeding, like everything else, may be done in a right or a wrong way.

Improved Tools in Loam Molding.

BY T. H. RADCLIFF.

THE usual and old-time way of molding a casting as shown in vertical section, Fig. 3, is to build up the outside, or drag, first, put on a sand thickness which represents the iron, then build the cope or core upon it, the time required will be as follows:

	Molders	Helpers	Days
Open sand plates	1	1	2
Building drag	2	2	2
Thickness and loaming pricker plates	1	1	1
Building core	2	2	1
Finishing and blacking mold and core	1	1	1
Pitting and casting	2	4	1
Unpit'g and cleaning up	0	4	1

This is equal to 12 days for one molder, and 18 for one helper. If we deduct two days on open sand plates, the time on each succeeding casting—of which there were six ordered—would be 10 days for the molder and 16 for the helper, making a total of 62 days for one molder and 98 for the helper on the six castings. Very little, if any, of the brick work is saved and the time has to be duplicated for each casting. By the use of the improved tools, as shown in Figs. 1 and 2, after the first casting, two molders and helpers with one core maker and helper can cast one of these kettles or stills every two days. The tools referred to are the sheet iron curb or casing A, Fig. 2, into which the brick work is built and which remains a fixture until all the castings ordered are made, saving the expense of pitting for

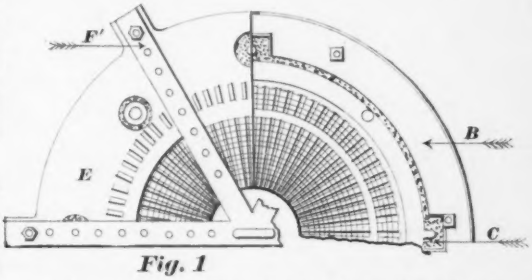


Fig. 1

each casting. The joint plate B, which is laid on the top course of brick and securely bolted to the bottom plate, when the casting is lifted out, it holds the brick work down and saves it complete ready to loam up for the next casting. The gate boxes C, of which there are four, are for the purpose of leaving an opening for the gates when the casting is raised, and brick work from being disturbed. They are rammed up with core sand each time.

The cope, instead of being built upon a thickness, is made by casting a sufficient number of pieces, as shown at D. An open sand mold is made for the cope ring and these pieces set to the right diameter and height in it. When the iron is cast around them the next day, a plate is cast in the center leaving holes in the same for the purpose of bolting the laper journal in which the sweep shaft revolves, as shown in cut. When there are flanges or lugs inside the cast-

ing, a slight change would have to be made in this construction to permit the cope being easily lifted off. The sweeps, instead of being made to leave a thickness to build upon, are made to run up the drag and cope separately, the cope being rolled over after it is dried, which will be understood by the pattern-maker.

The time compared with the previous case will be as follows:

	Molder	Helper	Days
Open sand plates	1	1	3
Building drag	2	2	2
Loaming up cope—core-maker and helper	1	1	1
Finishing and blacking cope, drag and casting	1	1	1

This is equal to 9 days for one molder and one helper. After the first casting one can be cast every other day easily with the force of men as above, which means 39 days for one molder and helper for the six castings being a gain of 23 days for the molder and 59 for the helper. This is a case that has occurred in practice. The sheet iron curb will be found a valuable tool in any shop. It can be made larger or smaller in diameter and any height required, and can be taken apart and stored in a small space. It is made of ¼-inch iron, 9 ft. center to center of holes by 26 inches wide. Five ¾-inch holes are drilled in each end to template for ¾-inch bolts, as shown.

The six-armed cross for handling large, heavy molds and holding the same down while casting, will also be found a valuable tool. The one shown is 12 ft. in diameter, center to center of outer holes, the holes being spaced 6 inches apart. One of its best advantages is that a straight bolt with nuts on each end can be used, doing away with the risk of hooks unbending and allowing copes with a great pressure upon them to raise while casting.

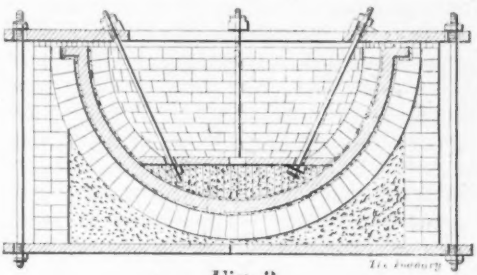


Fig. 3

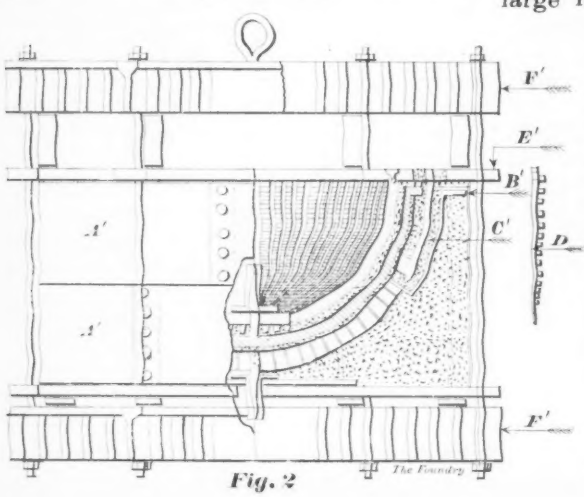


Fig. 2

Thinks Too Much Silicon a Detriment.

BY JOHN PETTIGREW.

SINCE the ingredients, contained in cast iron, with relation to its use in foundry practice, has become of so much interest to foundrymen, we have seen a great deal in the current literature, about the influence silicon has on the quality of castings produced. As, for instance, the large quantity of scrap a high silicon iron will carry and yet be fit to work well in the machine shop, a thing which amounts to a very large item in any manufacturing business.

As the discussion of the question is yet in its infancy, and the opinion that silicon is the "ruling element" for good or bad in cast iron seems to be taken for granted. We would desire to call attention to one drawback we have found in iron whose analysis showed more than 2.5 per cent. of silicon, that is the tendency it has to crack and break in cooling, more especially when used in shieves and gear, having solid webs and also in the arms of gear and pullies where the hub might have to be a little out of

proportion to the thickness in other parts of the casting.

We have found this to be the fact with irons made from Lake Superior ores, and also with Southern pig, melting with Connellsville and West Virginia coke. This was to satisfy us that the ores used in making the iron, or the fuel used in melting it in the cupola was not at fault.

It might be thought that the scrap carried would neutralize this tendency by reducing the silicon in the casting to 2 per cent., or less, but we have used from 25 per cent. to 75 per cent. of good machinery scrap and lost all our shieves in splitting through the web when they were about cool enough to kindle.

We have tried taking out the core and cooling off the hub with water, also letting them stay in the sand until cold with the same result, a large per cent. of loss through cracking, and if we should have any stand whole it required only a sharp blow from the clipper's hammer to send them in two pieces.

We had no trouble whatever with the same patterns when using iron when the silicon was from 1.50 per cent. to 2 per cent. whose fracture would show in large grains, although the sulphur and phosphorus was a good deal higher than in the high silicon iron used; the hammer could be used on them quite freely without producing a sign of fracture, showing that the strains produced in cooling was either less or that they were not evenly distributed through the casting, and evidently showing that the tensile strength of cast iron is very greatly reduced when the silicon contained in it is such as to change the appearance of the fracture from a very coarse grain to one that is fine.

To Make a 38 Inch Pulley From a 36 Inch Pattern.

MR. EDITOR:

PERMIT me to occupy a little of your space to reply to C. W. Mich., whose article appeared on page 35 of the January number.

More knowledge and information concerning the art of molding can be easily learned if we all unite in doing our share, and I must say that THE FOUNDRY is to be congratulated on the good work it is doing.

The plan suggesied by C. W. Mich. for molding pulley without an arbor is a most excellent one, I admit, but I want to describe something which while just as simple, may be even more useful.

I was given a pulley ring pattern 36x 6 by my foreman, Mr. Robert Cairns, who said a pulley 38x6 was wanted from it. I started it the ordinary way but placed 1" lagging strips around the outside, thin arms were bedded in drag, and cheek rammed up, anchor placed in position and rammed up, cope placed in position and rammed, then lifted off, pattern drawn, strips taken out, anchor lifted and arms and hub drawn and finished, then anchor replaced; and here is where the unusual part came in. The cheek was lifted to one side and small sections of an arm inserted in two of the openings and allowed to project to whatever character is needed, then take a piece of sheet iron rolled to the radius of a 38" circle, place against the arms and fill it between and core the desired amount. A pulley can by this means be made in various ways, and if care is taken in the matter of having sheet iron right size and filling in behind it, there is no reason why it should not be exact.

Yours, etc.

ROBERT ZANDA.

Watertown, Wis

A Resin Core.

John T. Glover, of Salem, N. C., writes with reference to the item appearing in a recent number of THE FOUNDRY concerning the party who had trouble with his cores.

I take one part of common resin to eight of sand, more or less resin, as the work may be heavy or light. I use it on heavy work without any difficulty and it will neither blow, cut or wash. Cores made in this way can be set in any position and remain any length of time.

The Scaife Foundry and Machine Co. has withdrawn its order requiring molders to make good all defective work and the men are again at work.

James Chalmers.

The Unvarnished History of a Common Man.

BY W. EDWARD.

CHAPTER V.

(CONTINUED FROM FEBRUARY NUMBER.)

MY first experience in a strange shop was in Pittsburgh and it wasn't a very pleasing experience either. I had spent several weeks visiting my aunt and my sisters, but as it was only a small town in which they lived, with one small foundry, I made no attempt to look for work, preferring to go to the city if I could get work there. It was only thirty miles to Pittsburgh and I had been there on different occasions, and you know how a boy who has been raised in a small town longs for the novelty and excitement of city life. At that time Pittsburgh was about the dirtiest city in the country. The hundreds of mills and factories burned nothing but soft coal and a cloud of smoke hung over the city like a pall, so that even on the brightest days it was a rare thing to see the blue sky, unless you were up on the hill tops which surround the city. The streets were narrow and mostly paved with cobble stones and every thing was begrimmed with smoke and dirt. Work was not very plentiful just then and I wandered over the city for two days before I got any sign of a job, but I finally struck it at——&——'s just as I was about to give up. After interviewing the foreman I was told to come on in the morning, so I hunted up a boarding house close to the shop and made preparations to come to work the next morning. I counted myself lucky in getting work, seeing that trade was so bad, but I soon found that the main difficulty was not so much in getting a job as in getting the permission of the men to go to work after I had got it.

While I was learning the trade there had been no organization of any kind among the molders at my home. There had at one time been a local union there, but it was always spoken of as a "stove plate" union, and so far as I know none of the machinery molders ever belonged to it. At any rate, when the stove shop moved away the union went out of existence and no attempt was ever made to revive the charter. Some of the men who came through carried a card, but there was very few of them ever worked in the shop where I had worked so I hardly knew what the union was for. The K. of L. was just coming to the front and while I had read about it in the papers I hadn't the slightest idea what kind of an organization it was. In fact, I was "green as grass" about labor organizations, their aims and purposes, and I was not a little surprised when informed by the shop committeee next morning that I would have to show my card or put up my initiation fee to join the Knights of Labor before I could go to work. This rather took the wind out of my sails, as I had never dreamed of the men objecting to my going to work and thought all I had to do was to get the consent of the foreman.

The next morning I was at the shop bright and early. I had been unable to sleep after five o'clock on account of the noises in the street and was in the shop by half past six inspecting the work and wondering what kind of a job I would get to start on.

None of the men spoke to me and, being rather shy, I did not ask any questions. When the whistle blew for seven o'clock the boss handed me a shovel, and after pointing out my floor, walked away. I hung my coat up and had just commenced to open up my heap, before wetting it down, when three of the men walked up to me and one of them said: "Well, young fella'h, wher's your ticket?" Thinking he referred to the time check, which I had been instructed to get at the office, I innocently told him that I had hung it on the board with the others and then I wondered what they were laughing at. After laughing at my innocence one of the other men asked me where I had come from and if I didn't know that this was a K. of L. town. I told them where I had worked and how I came to be there, confessing my ignorance of the K. of L., but offering to join if they would give me the opportunity. Two of the committee were in favor of letting me go to work and give me a chance, but the one who had asked me for my "ticket" couldn't see it that way so they concluded to call a shop meeting to decide whether they would let me go to work. One of them picked up a clamp and commenced to rattle on a shovel and as soon as the signal was given all of the molders quit work and gathered around the crane. Quite an animated discussion was carried on for a few minutes while I leaned on my shovel and watched to see what disposition was made of my case. In a few minutes a vote was taken, and it having carried, apparently, one of the men

came over and informed me that they had decided to let me go on with my work if I would "put up" the initiation fee of $2.50. This was something I had not looked for and I hardly knew what to say. I had only a few dollars in my pocket when I struck the city, and after getting a job I was not very economical with it. Then I had to pay a week's board in advance because I only had a small grip with me, so that it had left me with but a few cents in my pocket. I explained my situation to him and begged to be allowed to go on with my work until I could draw some money, promising that I would pay the initiation fee just as soon as I could get it, but he only shook his head and said that it was against the rules. It looked pretty blue for me when he went back to report to the men, who were still gathered under the crane, and I put on my coat ready to go, but after a heated discussion they concluded to let me work until Saturday, when I would either have to put up the initiation fee or get out. This seemed like a pretty rough experience to me for a starter, and I may say that I did not have any particular love for the K. of L. just at that time, but after the thing had been explained to me and I learned what it had accomplished for the molders of Pittsburgh, I modified my opinion considerably and looked upon it in an entirely different light.

Before the Knights of Labor was organized there, the wages had been whatever the molders had been able to get, but the best of them could not get above $2.35 a day, while a majority of molders in that district were working for less than $2.00. Within a very short time the K. of L. organized the molders and brought the basis of wages up to $2.50 a day almost without a struggle, and afterward, in conjunction with the Union and the Brotherhood, they raised the basis to $2.75 and made Pittsburgh a decent place for a man to work in. There is one thing I have never been able to understand, and that is, why men will persist in kicking down an organization after they have used it to accomplish a certain purpose.

I have seen the same thing in the K. of L., the Union and the Brotherhood until I wonder if it is only fools of the family that drift into the foundry, or if all the other trades are afflicted the same way. I have seen molders come together and form a solid organization for the purpose of resisting a reduction of wages or to get an advance, and just as soon as they gained their point down would go the organization, and no amount of entreaty or persuasion would induce them to attend the meetings or pay their dues. My philosophy is that if a thing is good we can't have too much of it. If organization is good for one place and one purpose it is also good for every place and other purposes. If the molders of this country would only come together and decide to act like sensible men and try to enforce something like a uniform standard of wages there would not be so much of this cut-throat competition among the manufacturers and it would be a great deal better for both sides. Men ought to be ashamed to demand three dollars for nine hours work in one town and then go to another, perhaps only fifty miles away, and work eleven or twelve hours for two dollars or less, but if you travel around this country very much you will find lots of this kind of work going on. Here I am traveling around the country hunting work wherever I can get it. In one place I must show the "red" card to get work, while in another town I must produce the "white" or be run out of town, but in the majority of places it makes no difference whether you belong to one or both of the rival organizations so long as you keep your head shut and attend to your own business. Now, what I kick about is, that a man's principles can't be recognized by these molder's organizations unless he carries the card of the organization which controls the trade in that particular town. This compels a man who has to travel around to keep up with both organizations, when, if they recognized each other, it would be only necessary to keep up with one and the other would recognize him as a union man when he showed a clear card. The way I look at it they are like two churches of different denominations trying to get to heaven by a different route. They are both aiming for the same point, and why can't they act like sensible men and not make fools of themselves by fighting each other.

Well, to get back to my story, the foreman must have been watching the whole proceeding through some convenent crack, as he did not put in an appearance until the trouble was all settled and the men were back at work again. I managed to get along with him fairly well and in due time I paid my fee and was initiated into the mysteries of the K. of L. I worked in that shop for three months and was finally laid off with a few others on account of a slacking up of work. By that time I had become pretty well tired of Pittsburgh and had a

desire to see other places, so when I was laid off I did not look for work any where else in the city but laid my plans for an extended trip through the country. There was another young fellow, by the name of "Jack" Anderson, who had been laid off at the same time. "Jack" had been raised in the city and had never been out of it, but, like myself, he wanted to see something of the world. At first we couldn't decide which way to go. "Jack" wanted to go east and I preferred the west, so we settled it by tossing up a penny and I won. I decided that we would keep to the river and take in the tows as we came to them. Accordingly, we started down the river the next day, striking East Liverpool, Wellsville and Stubenville without any success. On the third day we reached Wheeling. Right here I want to give you a piece of advice. If you ever go east steer clear of Wheeling. Pittsburgh was bad enough with the dirt and smoke, but at least they paid living wages and a man could enjoy life, but Wheeling is by all means the dirtiest place I ever struck and they expect a man to work for a song there. "Jack" and I wandered all over the place, from Martins Ferry to Benwood. We struck several jobs but the best wages we were offered was $2.00 a day and we couldn't see our way clear to work for that. Then we crossed over to Bellaire, which is a rather nice little place, but there was no show of a job there. "Jack" was so disheartened by his first attempt on the road that he made up his mind to go back to Pittsburgh that night, and I have never seen him since. I was not so easily discouraged and I determined to keep on. I got a river guide and found that the next town of any size was Marietta, so that night I took a boat for Marietta, arriving there the next morning. I was considerably disappointed to learn when I got there that there was only one small jobbing shop in the town and no show for any work, and I was not long in taking a train for Parkersburg. I had the same experience there, and thinking all the towns on the Ohio were the same as these two, I concluded there was no use wasting my time and I would go on to Cincinnati. As there was no railroads along the river then I went by boat and it took me two days to get there, but there was so much of variety to see along the river that I enjoyed the trip immensly. On arriving at Cincinnati my first care was to find a place to stop that would not be too much of a drain on my pocket as my money was running low. I found a cheap room, for which I paid a dollar a week, and it served to shelter me and to keep my clothes in. In two days I had enquired in every shop in the city that I could find work, but without success, and after I got all around I commenced over again and went about it in a more deliberate manner. I was as unsuccessful the second time as I had been the first and I began to wonder what I would do when my money run out. I watched the papers and answered all the advertisements for agents and help wanted, but I found that most of them were "fakes." It last I managed to get the promise of a job at Lane & Bodely's if I would wait until the patterns were ready. Here was a dilemma. The patterns would not be ready for a week and my money would not last two days longer. That night I studied the matter over and tried to devise some scheme to hold me up until I could get to work. I finally struck on a plan and immediately put it into execution. My clothes were in pretty good shape, although I had not very many of them, so I brushed myself up as well as I could and marched into a first-class hotel where I registered and asked for a room. The clerk looked at me but said nothing about paying in advance and assigned me to a room. I had not eaten a square meal for two or three days and I did justice to the excellent dinner that was on the table.

(TO BE CONTINUED.)

He Had Heard Enough.

LIGHTLY the burglar moved from room to room through the house, whose inmates, wrapped in the blissful sleep that come to the weary breast after an evening spent at an amateur concert, heard not his feathery foot-fall. Borne to his quickened senses from the sleeping chambers came the sound of deep, regular breathing that seemed mechanically to mark the flight of time as it moved on sluggish wing toward the great beyond.

Passing noiselessly into a large apartment he turned his dark lantern about until its pale rays fell upon a rich dressing case on whose polished marble top were scattered in careless profussion the jewelry and other personal adornments of some strangely neglected wearer.

His hand closed eagerly on the costly trinkets, and he was on the point of transferring them to the capacious pocket of his overcoat

when one of the slumberers moved uneasily and in a muffled voice made the remark:

"Great Scott, Emily, I thought I had explained it so you could understand it! Now, if you won't interrupt me I'll give you the facts about this whole tariff business from beginning to end——"

The jewelry fell from the nerveless grasp of the burglar. Gasping for breath, he staggered to the nearest window, jumped blindly through it, carrying the sash with him, and fell upon the sloping roof of the kitchen, from which he rolled to the top of the coal-shed, and thence to the ground, alighting in a snow bank; and without stoping to pick up his hat or his lantern, he dashed with breathless haste away from the premises and vanished in the darkness. He had secured no booty, but he had escaped a horror worse than death.—*Chicago Daily News.*

Books, Exchanges, Catalogues, Etc.

The Haverhill Iron Works, Haverhill, Mass., are sending out a neat little pamphlet descriptive of the very large line of foundry and machine work made by them, as well as machine supplies, etc., carried constantly in stock.

The Ohio Sand and Clay Co. seems to be one of those concerns that are bound to "get there." No matter who gets left in the race, they propose to be winners, and judging from the very neat and original style of some advertising matter recently sent out by them. They are of the opinion that there is business to be had and are going to push for it. Recently we have received some blotters that bear up bravely under a large amount of information concerning molding sand, fire brick, etc., and these have been again supplemented by a neat catalogue on book paper, illustrating all the various shapes and styles of brick and furnace lining they manufacture for the trade.

The complete novel in the March number of *Lippincott's* is "A Desert Claim," by Mary E. Stickney. It is a charming tale of life in Northern Colorado. Gilbert Parker's serial, "The Trespasser," reaches its ninth chapter. "The Inmate of the Dungeon," by W. C. Morrow, is a story of uncommon power. Joel Chandler Harris, in "The Late Mr. Watkins of Georgia; His Relation to Oriental Folk-Lore," compares a curious legend of his own State with one of India. In "A Prophet of the New Womanhood," Annie Nathan Meyer considers Henrik Ibsen from an unfamiliar point of view. Emma Henry Ferguson tells "More About Captain Reid," the Confederate blockade runner. John Gilmer Speed describes "The Training of the Saddle Horse." Dr. Charles C. Abbot writes of "Bees and Buckwheat," and Charles McIlvaine of "The Evolution of Public Roads." In "Talks with the Trade," the subject of "Literary Mendicancy" is presented. The poetry of the number is by Anna Robeson Brown and John James Meehan.

The March number of *The Century* contains a great variety of points. The opening article is a sketch of the Tuileries under Napoleon III, written by a lady who was a governess in one of the court families. The accompanying portraits are especially interesting. The announcement of the book on Lourdes by Zola gives timeliness to "A Pilgrimage to Lourdes," by Stephen Bonsal—a graphic record of individual experience at this famous shrine. Mrs. Van Rensselaer describes one of New York's most beautiful buildings, the Madison Square Garden; "Josiah Flynt" writes of "The City Tramp," and incidently shows the crying need of organized charity; Prof. Edward S. Holden tells a good deal that is new about earthquakes and how to measure them; the Rev. Dr. Washington Gladden writes of "The Anti-Catholic League" in a way that will attract wide attention; William Mason, the well-known musician, discusses the work of the Norwegian composer, Edward Grieg. Major Andre also is a contributor to this number; his account of the "Mischianza," the famous festival given in honor of Sir William Howe in 1778, is printed from Major Andre's manuscript, heretofore unpublished. Not more than half of the contents of this rich number are here enumerated. Published by The Century Co., New York.

DECLINE OF WHALING.—The whale fishery was at one time an enormous industry in the United States. It reached its height in 1854, when 602 ships and barks, 28 brigs and 38 schooners, with a total tonnage of 208,399, were engaged in it. By 1876 the fleet had dwindled down to 169 vessels, and it is doubtful if fifty are now at sea. The introduction of kerosene, and the increasing scarcity of whales seem to be the causes of this decline. Some remarkable voyages were made in the old days. "The Pioneer" of New London, sailed in June, 1864, for Davis Strait and Hudson's Bay, returning in September, 1865, with 1391 barrels of oil and 22,650 pounds of bone, valued at $150,000. In 1847 the "Envoy," of New Bedford, was sold to qe broken up, but her purchaser refitted her and she made a voyage worth $132,450. On the other hand, a vessel made a five-years' voyage, and on her return the captain's lay was only $85. But, as the Nantucket captain, whose vessel returned from a three years' voyage as clean as she went out, remarked: "She ain't got a bar'l o' ile, but she's had a mighty fine sail!"—GUSTAV KOBBE, in March *St. Nicholas.*

"All things come to him who hustles while he waits." This is a sign that an Eastern business man devised as a hard times sign. The hard times are practically over, but if each and every one of us takes this motto as his own we will have an era of great and universal prosperity in something less than a week and a half.

Solid Emery Wheels.

The distinctive feature of the various makes of solid emery wheels is in the kind and quality of the cement used. They may be divided into, first, wheels in which gums like rubber and shellac are used; second, those cemented under hydraulic pressure and dried and seasoned, like the Northampton and Tanite wheels; third, wheels made by pressure and moulding, and cured by heat like the Hart or Detroit wheels; and fourth, the several vitrified makes, in which a flux is melted into a cement.

No one kind of a wheel is the best for every kind of work. The rubber cement has to be softened and melted by frictional heat before the emery will cut without glazing, and this takes much extra power. Other cements are not good conductors of heat, and causes the surface of the wheel, if used dry, to flake out or "spall" off. Vitrified wheels have to be watched carefully, as they are of a brittle, glassy nature, easily cracked by a blow. In fact, emery wheels are like steam boilers—very useful, but must be in good condition to stand the strain, and should have intelligent care, with frequent inspection. They should also be kept round, as, if out of round, they cut only on the high side and thus waste the time of workman, and also are worn into cams and strike a dangerous blow, where as a round wheel gives a continuous cut the whole circle. A careless workman, bringing his castings against the wheel with a blow as he starts grinding, causes many wheels to get out of round.

The best cement is one which binds the emery together with sufficient strength to resist the centrifugal strain due to the high speed at which emery wheels cut best—about 5000 feet surface speed per minute. It must not soften by frictional heat, nor glaze, nor burst, nor become brittle and break with cold. It must not hold the cutting grains until they are too dull to cut; nor release them so readily as to waste away the wheel too fast. It must be capable of being thoroughly mixed evenly, with the grain emery, so that the wheel may not have either hard or soft spots and be out of balance, and it must also be capable of being tempered to suit different kinds of metal or work. As great care and skill is required to select and use only pure and strong chemicals in these cements, and as careful, skilled workmen are necessary to manipulate and use them aright, one runs great risks in buying wheels to try from any but well-known, experienced and thoroughly responsible makers.—*Cassier's Magazine.*

Conditions in 1893 Not the Same As in 1873.

Pessimists now take their cue from the after effects of the panic of 1873, and based upon the idea that history usually repeats itself, expect that the same experiences should now be realized as those attending the 1873 panic. It is only necessary to review the conditions at both periods to show that the position taken is not well founded. For instance, at the corresponding date after the '73 panic, the surplus reserve of the New York banks was about $33,000,000, while now it is $93,000,000. They also lose sight of the fact that since 1873 there has been an increase of government circulation money of $572,000,000. This will soon be found a means of rapid recuperation, as it is to the business situation what lubricating oil is to machinery. Besides which the recent panic found the business affairs of this country on a more conservative basis—nearer a cash basis—than in 1873, as it was the expansion of credits caused by excessive railroad building at that time that really caused that panic. It was a railroad expansion panic. Almost every banking firm stood sponsor for the securities of a railroad, newly built, or one under construction, and had the bonds of the various concerns under hypothecation. It was the forced liquidation of these obligations that sent most of the railroads and their backers into bankruptcy. The recent panic was entirely free from that difficulty, consequently the recuperation in this country after the recent panic should not take as many months to accomplish as it did years after 1873; nor will it, in my opinion, alter the tariff and government financial legislation at Washington have been finally settled, which cannot now be far off; at any rate in a few weeks, if not days, we will know enough about that to expect to be able to discount the finality.—Henry Clews.

The Union Manufacturing Co. is the name of a new foundry enterprise at Boyertown, Pa. John Labold is manager.

Mr. Davis has leased the Rome Foundry & Machine Works at Rome, Pa., and will push the business for all it is worth.

The Salt Lake Co-operative Iron Works is the name selected by twenty-five Salt Lake mechanics who have leased the old Salt Lake Foundry for a term of years, and propose to make business hum.

THE FOUNDRY

A TECHNICAL JOURNAL DEVOTED TO FOUNDRY INTERESTS.

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The Lack of an Apprentice System.

WANT of space compels us to omit a very interesting article from the pen of Mr. Thos. D. West on the apprentice system, or rather, the lack of it, these days. It will, however, appear in the April issue of THE FOUNDRY and will be followed by another in which Mr. West will show the imperative need of some uniform and regular system, and suggest a method of bringing it about.

Back Numbers.

BACK numbers of THE FOUNDRY for the months of January, March, April, May, and July, 1893, are wanted in this office. Anyone having copies for these months to spare can have their subscription extended for one year free of charge by sending them to this office, or we will send 25 cents to any one sending us a copy for any of those months.

Western Foundrymen's Association.

MAY 25th the Western Foundrymen's Association will be a year old, and as its first annual meeting will be in order just about that time, THE FOUNDRY would suggest that it make the occasion a memorable one and send a special invitation to all its members to make an extra effort to be present at that gathering. It seems to us that instead of having a paper to discuss on some technical subject, that this meeting might be enlivened by a number of short addresses, and following the example of the Eastern Association, something in the way of a banquet should be in order to cheer and render more joyous an occasion that ought to be thoroughly appreciated in all its significance by foundrymen everywhere. If gone about with energy and in the proper way, it may also be the means of doing the association much good.

We Get Notice.

IN our last issue we referred to an action that had been brought against the Holland Radiator Co. and T. Holland, of Chicago, Ill., and Bremen, Ind., by a former employee, and were very careful not to say anything that might do the defendants in the case any wrong. Since then we have received a letter from Mr. T. Holland, president of the Holland Radiator Co., in which he advises us that he has "in-

structed his attorney," etc., and we can expect trouble right away.

Now, if there is to be any "attorney" business, we wish to give notice that we will be found at home when that gentleman calls, but if a little advice would be acceptable to Mr. Holland, we would just suggest that he leave THE FOUNDRY alone, unless he wants to see considerable light and ventilation let in on matters that would do him no good. This paper is published in the interest of the *whole foundry business*, is free and unmuzzled, differing in that respect from some other trade papers in this country, and while we can devote our space to more valuable subjects, it is a question wether we might find anything more interesting.

An Everlasting Wrangle

THE foundry world seems doomed always to be scourged with more or less annoyance in the way of labor troubles. When times are good the molders get together, talk over the situation and make up their minds that in proportion to amount of skill and physical labor needed in their business, they are not paid as proportionately good wages as men engaged in other trades, and in many cases they are right. The movement for increased wages sets in and right here they commence to be wrong, as in nine cases out of ten the matter is gone about in such an arbitrary and unreasonable manner as to unnecessarily embitter the relations existing between the employer and employee, and even supposing the latter's efforts are crowned with success, the employer finds no pleasure in conceding what perhaps his men are entitled to, but does it with a mental resolve to get even the first opportunity, and this feeling is more than likely kept alive by incessant bickerings with his employees afterwards. The great trouble with our labor organizations and those who compose them is the lack of good generalship and capable advisers among the men themselves. Their International officers, as a usual thing, are generally anxious to avoid trouble, knowing that a failure is likely to be laid at their doors and a success just as likely to so intoxicate the men and embitter their relations with their employer that the latter is only awaiting an appropriate opportunity to regain what he thinks he has lost. No, the bulk of the trouble lies with the local leaders in these matters, the conservative thoughtful, experienced man is shoved to the rear and the agitator, who flatters his fellows by glibly picturing their wrongs and the radical means needed to rectify them, is pushed to the front and becomes the hero of the hour. But, as we have said before, the trouble does not end here always, molders get organized and become arbitrary about so many minor matters that instead of doing their best to smooth away existing friction, they keep looking for more and generally get it.

The foregoing is intended to refer only in a general way to the majority of cases, and in no wise relieves from responsibility the unscrupulous employer of which there are unfortunately only too many, and THE FOUNDRY is not at all convinced that all this reducing of wages that has been going on for the past few months has been demanded by the stringency of the times. As an instance, the daily papers have been recently publishing reports of the progress being made in the attempt to secure a second reduction of wages in a few months in one of our leading American cities by the local association of Iron Founders. The men conceded the first reduction of 25 cents a day and are now asked to submit to another, which, without a struggle, they do not propose to do.

In years gone by it was the stove molders who gave the bulk of the trouble in the way of strikes, lockouts, etc., but they have very happily ended their troubles through the medium of an understanding and mutual agreement entered into between the National officers of their organization and the officers of the Stove Manufacturers Association. It seems to us, therefore, that if something similar could be done in the case of the jobbing machinery and specialty molders, say between the Foundrymen's Association on the one side and the Molders' organizations on the other, it would be the means of conferring an everlasting boon on the whole business, and be the means of bringing peace and quiet where there is now so much chaos and confusion.

The Scrap Heap.

That the Foundrymen's Associations are accomplishing a good work is evidenced by the amount of discussion and general interest created by a few papers that have recently been read at their meetings.

* * *

The ball was opened by a paper read by Mr. E. A. Wheeler before the Western Foundrymen's Association in Chicago, and which ap-

peared in THE FOUNDRY of January 10, in which he took occasion to enlarge on the benefits to be derived from having chemical analyses made of the raw material entering into the cupola with a view of regulating the product and maintaining any desired standard. Many side issues were brought out during the discussion that followed, and much matter other than that referred to introduced, but Mr. Wheeler's paper left the impression that chemistry was a more necessary article than was generally supposed.

* * *

Mr. Keep's reply, appearing in our last issue, rather takes exception to Mr. Wheeler's paper. In the first place, he points out that for economic reasons it becomes desirable that the average founder should use as much scrap as possible and an exact analysis of the scrap would be impossible, while pig iron does not run uniform for the reasons explained in these columns in our February edition.

* * *

The samples taken from a furnace cast, will not correctly represent the whole iron, and it is a question if they would be near enough to be reliable, and even if a chemist's certificate were sent with each cast, the chances of mixing iron at the furnace when loading, unloading, or in the yard, are very great.

* * *

Mr. Wheeler's paper contained a record of the analysis of six different casts made in one day at their furnace when conditions were as nearly as possible alike, all the iron being No. 1 grade and showing no difference in the fracture, and yet it varied all the way from 1.94 per cent. of silicon to 2.43 per cent., and from .009 sulphur to .035 sulphur, the one that was highest in silicon being lowest in sulphur, and vice versa, this of itself showing in a small way the degree of variation possible, and proving the unreliability of an analysis unless every heat is analyzed and piled separately and afterwards kept separate when shipping, and no furnace on this continent would if they could do such a thing, and unless they did, an exact or anything like an exact analysis for the guidance of the foundryman would be out of the question.

* * *

If the foundryman could get just what he wanted and knew that he was getting it, he would be able to secure the very good results spoken of by Mr. Wheeler in his valuable paper, but there the uncertainty comes in.

* * *

Mr. Wheeler says "every foundryman should keep his own chemist or buy his iron on analysis and demand a chemist's card with each car."

* * *

In the first place it would be out of the question for one foundry in a dozen to keep their own chemist, and for the reasons mentioned above it seems to us that the chemist's card is equally as unpractical.

* * *

Mr. Keep, in writing of his doubts whether or not the average furnace keeps a chemist, says he believes they do not and "no furnace running wholly on foundry iron analyzes its pig iron." If they do not, how is the founder to get his "card," spoken of by Mr. Wheeler.

* * *

Now comes Mr. Wm. Molin, of New York, on the scene with a letter in the *Iron Age*, which we publish elsewhere, in which a strong stand is taken against the doctrine preached by the able inventor of Keep's Tests.

* * *

Like Mr. Wheeler, he is a strong advocate apparently of chemical analysis, and makes some good points in support of his position, but in all this there is lacking proof as to—First: Can an exact chemical analysis be procured of the iron entering the cupola without having a chemist attached to every foundry, and—Second: Of what actual use would it be to enable a foundryman to produce a casting strong enough to stand a test of 3500 pounds on a bar 1"x1" and 12" long.

* * *

It is not what is in the iron that we want to know, but what will it do, and while iron possessing 2 per cent. of silicon is better for ordinary purposes than one with half that amount, and will produce a better casting, yet the result can only be obtained or known by a physical test.

* * *

The differences apparently existing between the positions taken be these gentlemen consist largely, we think, of a misunderstanding of each others position. Mr. Keep is evidently of the opinion that too much importance has been and is being given to the subject of chemical

analysis, while the means of determining or proving the result has been lost sight of.

* * *

On the other hand, the chemists seem to discredit the value of the physical test, which they seem to think is intended to supplant the work of the laboratory.

* * *

As a matter of fact, the co-operation of both the chemical and physical tests is required to insure the fullest knowledge and success, though the idea of utilizing the chemist to the extent suggested by both Mr. Wheeler and Mr. Molin, does not seem necessary.

* * *

If the iron is all right, the physical test will be needed to prove it, and if not as good as it should be, the physical test will discover the trouble and the proper iron can be used to rectify the evil, provided it arises from that cause, and the question now is, can chemistry do the same thing?

* * *

We cannot close this without referring to the information regarding iron mixtures, given by Mr. Outerbridge during the discussion, February 7, at Philadelphia, showing how a thorough knowledge of chemistry can be used by a practical foundry manager, as a preventive from some of the evils complained of so often by foundrymen who are in the dark as to the reasons for any little variation in their mixtures at any time.

Answer to Criticisms on the Machinery Molder.

MR. EDITOR:

PROFESSOR JOHN E. SWEET, of Syracuse, in the *American Machinist*, Feb. 22nd., 1894, says: "There are two ways to promote discussion. One is, to say something the listeners like to hear, whereat many are ready to add their hearty indorsement, and the other to say what they do not like to hear, which will bring up as many to refute the assertion." The logic expressed by several correspondents in the last number of THE FOUNDRY would lead me to think I had said something grating.

It often does us good to be crossed by other's opinions and experience, for in this respect we oft can radically differ and then in the end find an exchange of ideas prove very beneficial. It depends largely upon the focus one's experience permits him to draw in discerning what we think correct. Our Springfield founder approves of Jack calling up the boys to exchange ideas as regards the best plan to make a new job. Such may work very well in that shop, but I could not say it looked mechanical or would inspire a foreman whom the firm holds responsible for good work, with confidence in feeling assured Jack was going to turn out at the first go, a perfect casting. I would ask of V. S. if he would approve of such a system in a shop of one hundred molders working on castings ranging from one hundred pounds up to thirty tons, if every morning about fifty of the men would receive difficult, strange, new jobs. I am afraid that before the boys could complete the rounds exchanging ideas, half the morning would be lost and the good fellows that exchanged ideas so often would not know which were their own when they got back ready to start their own jobs. No! This post mortem business before and after pouring a mold I cannot endorse. I prefer knowing Jack has the experience and idea to pull through on his own hook. A foreman running a heavy work shop, having men that would have to chase all over it to get ideas from his shop mates, is pretty safe in concluding such men are weak in experience and knowledge of the art of molding, and I am very much afraid that to get good perfect work, he would be badly worn out in body and mind by practicing what V. C. so radically condemns, "standing over a molder until his mold was complete." I fully agree with V. C. in his defense of the better husband and father, but must say, his own logic has not favorably impressed me with that of the better mechanic.

"Turning over" the next with comments on the question, is the editor with his "Plenty of room for discussion." He makes a very "clean lift" of the subject, and draws us up steadily to the "parting line" of the apprentice system and refers us favorably to Michigan.

As to the statement contained in the latter's letter, I can only say "amen," and naturally must feel very kindly towards him, for without his support I would have had good cause to feel very shaky, but as it is, you can all see I am not in the least daunted in endeavoring to stand by my guns, which I know fired some very hot shot, and which seems to have effectually aroused our commanding forces, among the foremost of which are we to find Mr. Ferguson with a return fire that is not easy to be subdue. He asks some questions well put, as they give me an opportunity for explaining

elements which I hope will throw some light upon the stand I have taken. He says: "I do not know where Mr. West has been to get such radical ideas of the general worthlessness of the molder of day," I would answer. Around the country and listening to foundrymen's "tale of woe," and if this is not sufficient to awaken one, then let any molder go into any of our large ctities as soon as the administration is through tinkering with the tariff and start up a jobbing machine business, where, in order to have conditions at all favorable for meeting with success he will find it necessary to cast every day and run from thirty to sixty molders. Several years ago I received an experience in this line not to be forgotten in a hurry. A pattern maker and a molder with myself took our savings of many yeasr' hard earnings, aggregating $4,500, leased land, erected a wooden shop 45x70, with a side wing for engine, boiler, cupola and oven and started in. Previous to this the writer had been foreman in a large heavy work machinery and engine shop for six years, but owing to the work being of a class that had largely been repeatedly made, and the molders in it chiefly of the old school and good steady fellows, things ran very smoothly, and not having but occasionally to bring in many new men, I had a "snap" to what awaited me later on in attempting to start a new shop with new men and new work that today would be of one character and tomorrow of another, ranging all the way from one pound up to twenty tons. Would space admit of detailing all the expense and experience of that one shop in trying to obtain good molders and get out good work, we could throw much more enlightenment on the subject. We must all bear in mind, there is a big difference in running a complete or partial specialty shop, or one that only makes castings for their own use exclusively as against the jobbing shop that is supposed to make any and everything in the shape of castings for the outsider who as a general thing will only accept the most perfect work and generally wants that the day before its ordered.

If there are any who think there are no scarcity of good reliable machinery molders let them start up such a new jobbing shop that would engage from thirty to sixty molders, or let any heavy work founder requiring and employing reliable good skilled molders, discharge every man in their shop that might be able to make their most difficult work without losing from one to six before getting one good casting, and then try to replace such men. I think any venturing such an experiment would discover to their sorrow a most deplorable scarcity of good machinery molders.

It is experience emanating from tribulations of the above character that have been one great cause of the founder's business arranging itself in specialties as found today, and it was only by resorting to such a system of manufacture that the founder has been able to meet competition and in many cases produce perfect work.. For the reasons above stated, all work that it is possible to classify and make a specialty of, we find the manager or foreman arranging for its adoption, as he can much better afford to let a man experiment or chase around a shop to get ideas how to make a job he can keep him steady on, than give him a new job every day, hour, week or month, and when we get down to weigh all the elements that have led up to the present improvement or quality of castings, we will find it has been chiefly the manager's or foreman's tactics in arranging for the adoption of improved appliances and any system that would permit a man practicing or experimenting on one job until he could make perfect work without loss and then keeping him on it as long as possible.

A. C. with his answer in rhyme would be more convincing in the logic of many of his lines had he only substantiated his assertions more with facts. Some of these are true, and what are not so would require more space than we are justified to occupy in this issue, and as the general tenor of my logic to others is sufficient to show my reasoning on the stand he has taken, I will not argue in detail the statements in which I think he is in error.

The article that called up all this discussion, said the molder was degenerating as a class. It is hardly necessary to say that I did not mean there were no good molders in the field, although some seem to have taken it that way. Were such the case, we would be in a sorry plight, and while those in existence possessing ability and skill are of the utmost value to the founder, yet how competent would we be as a trade to meet all demands for castings, did we turn backward and adopt the old jobbing system to manage all our present castings, or in other words, be dependent on the ability and skill of machinery molders as a class to successfully, without loss of work change from one job to another. We cannot but admit if in "ordinary times" we should adopt such a sys-

tem to supply all demands for castings with the small number of able skilled molders that are in the field who can make anything given them in the various light and heavy lines of machinery founding there would be a famine among buyers or a stagnation for the want of castings in our manufacturing machinery lines.

When we permit our minds to reason seriously, we cannot but be impressed with the fact that at the present day management in the adoption of system, modern improvements and appliances has everything to do with enabling the foundries of this country to supply the demands of an exacting and pressing market for cast iron products, and in many cases we have great odds to fight against to be successful.

I do not desire any to think that this discussion is in any way taken as a personal matter. It is not the poor molder I am condeming, but the principle that is responsible for his being so, which mainly is in the lack of a recognized apprenticeship system. There is certainly room for profitable improvement to all concerned in creating a higher standard for skill, and the flag I have there raised and unfurled on the pinacle of our art in founding I will do my utmost to protect, and not only will I fight to have it recognized and respected by the molder but by all the mechanical world. I am proud of my trade because it demands and gives every opportunity for the display of the highest talents of mechanical skill which I can intelligently affirm through long experience in various branches of the foundry business.

Yours truly,

THOS. D. WEST.

The Rankin & Fritsch Foundry and Machine Co., of St. Louis, states it has received more orders and inquiries during the past few weeks than in the past two months. The company is running a good many men and if the improvement continues for a few weeks longer it will be able to run its full force on full time.

The North Carolina Car Co., of Raleigh, has begun the erection of its new plant. The foundry will be 82x172 feet with cupola and furnace, while the car-erecting shop will be 86 x120 feet.

The Willian Powell Co., of Cincinnati, O., has recently completed its new plant which is claimed to be the most complete of its kind in the country. The offices, warehouse and brass finishing departments occupy a space of 119x 175 and the foundry plant 60x150 feet.

Pittsburg and Vicinity.

The Trade Outlook.

(*Special to* THE FOUNDRY.)

THE past month was a quick one, no change occurring in the market worthy of mention. Fears are now being entertained that things are again beginning to settle down again in the same condition in which they remained for so many weeks. Reports from different parts of the country show the condition of affairs to be uninteresting in the extreme.

Prices are still ruling low. No. 1 foundry iron can be had for $11.25@$11.50 cash while No. 2 is worth $10.50@10.75 cash. In foundry and forge irons quietness prevails everywhere and those who look for causes underlying market movements say that the present uncertain state of the tariff question is to be blamed for the bad state of affairs. Some deny that the trade in general is now at as low an ebb as it was a few months ago. This may be true of the market for structural material only, as a number of fair sized orders have been placed. It is thought that by the opening of spring, a good line of orders will be brought in. The Pittsburg prices for foundries are:

No. 1 foundry,	- -	$11.25@$11.50	Cash
No. 2 "	- -	10.50@ 10.75	"
Charcoal, No. 1,	-	17.50@ 18.00	"
" No. 2,	-	17.00@ 17.50	"
Charcoal, coal blast,		23.00@ 25.00	"

The Chaplain-Fulton Manufacturing Co., recently cast a 4,200 pound bell for the Sewickley public school.

The Totten & Hogg Iron & Steel Foundry Co. is operating its plant regularly. It recently received an order from Marshall Brothers & Co., of Philadelphia, for a pair of chilled rolls 24x32 inches in size. It is also remodeling the plant of the American Tin Plate Co., of Ellwood, Ind.

The Fischer Foundry & Machine Co., of the South side, recently finished the work of remodeling the Benwood plant of the Wheeling Steel & Iron Co. and which is now in successful operation.

The Reed Foundry Co., Limited, a partnership association formed for the purpose of manufacturing stoves and to do a general foundry business, has been dissolved. The company has ceased to carry on its business, has paid all its debts and has wound up its affairs.

The Robison-Rea Manufacturing Co. has been awarded the contract to erect four stands of rolls for the American Tin Plate Co., of Elwood, Ind., which will cost about $10,000.

The Lewis Foundry & Machine Co. has made application for a charter of incorpation. This new corporation will succeed to the business carried on by the Lewis Foundry & Machine Co., Ltd.

The Leechburg Foundry & Machine Co. has received the contract to change the sheet mills of Ellwood, Pa., Tin Plate Co. into tin plate mills. The outfit will consist of a complement of chilled rolls, four doubling shears with engines, additional cold rolling mill, two of Mesta's patent squaring shears, one of Mesta's patent pickling shears, including crates, vats, etc. When the above changes and additions are made it will be a complete four mill tin plate plant.

The Fischer Foundry & Machine Co. has contracted to furnish all the power transmitting machinery for the new plant of the Sterling White Lead Co., of New Kensington, Pa.

Application was made on the 9th inst. to incorporate the Lincoln Foundry & Machine Co. James Kirkwood, Otis H. Child, W. F. McCook and others are interested in the new concern.

About 10 molders in the employ of Walter & Walker's foundry, in Sharpsburg, have refused to work because of the employment of apprentices, which is contrary to the rules of the Molder's International Union.

Among the Foundries.

James G. Newbury will build a foundry in Coxackie, N. Y.

The McKinnon Mfg. Co., of Bay City, Mich., have their new foundry completed.

The Norwalk Foundry & Machine Co. are building a brick addition to their plant, 100x50 feet.

Geo. Wilson & Son have the Kelly & Morgan foundry at Osage, Ia., and will re-open and operate it.

The Boyd Foundry Co., at Huntington, Ind., has assigned. Liabilities, $103,000, assets, $177,000.

M. D. Williams fell while carrying a ladle of iron in the foundry of the Owatomia Mfg. Co., Owatomia, Minn., and was severely burned. He will, however, recover.

Frank Horribon has purchased the foundry department of J. W. Tubbs' foundry and machine shop, at Corning, N. Y.

The Warren Foundry & Machine Works at Altoona, Pa., are expending over $100,000 in new buildings and machinery.

The Burr & Bailey Co. and the S. W. Skinner Co., of Wilmington, N. C., have been absorbed by the Wilmington Iron Works.

The St. Albans (Vermont) Foundry Co., of Indianapolis, Ind., has a contract to furnish 100 refrigerator cars for Armour & Co., of Chicago.

Head's Iron Foundry, of Utica, N. Y., has been succeeded by the firm of Gibbin & Co., who will continue to operate the plant the same as before.

The Ensign Mfg. Co., of Huntington, W. Va., states that the car wheel and gray iron foundries are running as usual, while the car department is closed down.

Hoyt & Wynkoop's foundry, in Troy, N. Y. has resumed work with a full force of men. It is said that this is the only plant in operation in that city at the present time.

The Rockford (Ill.) Foundry Co. has been organized to cast all kinds of metals. The capital stock is placed at $10,000 and is held by G. W. McArthur, J. R. Evans and E. R. Manard.

The Elliott Car Co., of Gadsden, Ala., have purchased the plant of the Bluffton Car Wheel Co. of Bluffton, Ala., and will increase the capacity of its car wheel department to 250 wheels per day.

Spence, Baggs & Co., of Martin's Ferry, O. are operating their foundry four days out of the week. The stock on hand is very large, but they think that manufacturers should do their best to give work to their employees.

The West Point Foundry, at Cold Spring, Newburg, N. Y., has obtained an order from the United States Ordnance Department which calls for eight carriages for 12" mortars. About 160 men are now employed at this plant, which is about two-thirds of the regular force.

The Utica (N. Y.) Pipe Foundry Co. has resumed work at its plant after a shut-down of two months. A reduction of 15 per cent. in wages has been made and which was readily accepted by the men. John A. Kernan is now manager of the plant and John K. Gunn superintendent.

The French-Wiggins Engineering Co., of Little Rock, Ark., was incorporated a few days ago for the purpose of carrying on a general foundry and machine shop business. The Brodie foundry in that city has been leased and the company will soon put the plant in operation. C. P. Wiggins, Jr., H. M. French and R. W. French are the organizers.

The Lake Shore Pipe Foundry, in Cleveland, is at law with the latter city on account of some pipe purchases the latter made from Chicago parties. It is claimed that the city violated its contract with the local company, while the city's representatives think they are justified in their position from the fact that an alleged "combine" exists to keep up the price of pipe.

The jury in the now famous damage suit for $10,000 of R. Bruce against Iron Moulder Union No. 180, of Tacoma, Wash., has returned a verdict for the defendant. It is the second case of this kind just tried in this county. Bruce was formerly a member of the union, but was suspended for non-payment of a fine of $25. He was blacklisted and could not obtain work at any foundry on the coast. After being idle four years he brought suit for $10,000 with this result. The case will probably be appealed.

New Foundry Enterprises.

Chas. W. Reynolds will erect a foundry at Champaign, Ill.

J. B. Thompson will build a brass foundry at Haughville, Ind.

The Lincoln Range & Furnace Co. is a new concern at Lincoln, Neb.

Daniel Baker, of Cuba, will erect a foundry and machine shop at Andover, N. Y.

The foundry of the Wilson Laundry Machine works, at Columbia, Pa., is getting a new cupola.

Alfred L. Smith & B. F. MacCartney have leased the foundry and machine shop of Irwin McFarland in West Indiana, Pa., and will conduct the business on an enlarged scale.

Messrs. Stokes, Sinagle & Clark, of Spring City, have leased the foundry and machine shop of John W. Jacobs at Lansdale, Pa., and will commence shortly the manufacture of some specialties.

Miss Bacon—"On the ranch we girls ride the horse barebacked."

Mr. Nickerbocker (severely)—"I should think the sun would blister you terribly."

The Fire Fiend.

Jas. Gurney & Co., East Boston, Mass., had a $1,500 fire in their foundry January 31.

The Turner Brass Works, Chicago, had a $6,000 fire in their brass foundry January 15.

James L. Haven, the well-known Cincinnati foundryman, suffered from a $5,000 fire January 27.

Greenberg Sons had a fire in their foundry at San Francisco, Cal., January 6, that cost them $4,000.

The Holly Manufacturing Co., at Lockport, N. Y., suffered to the extent of $7,000 from a fire January 13.

Carlson & Anderson, proprietoas of the Austin Iron Foundry at Austin, Minn., had a $1000 fire January 20.

The Bloomington Stove Works at Bloomington, Ill., was destroyed by fire Feb. 25th. Loss $20,000, fully insured.

The Union Foundry & Stove Works at Frederick, Md., was totally destroyed by fire Feb. 3rd. Loss about $20,000.

The brass foundry of T. Young and the Blatz Brass Foundry Co., West Monroe St., Chicago, were recently burned out.

The Pomeroy Foundry & Machine Shops, at Pomeroy, Ia., were totally destroyed by fire January 8. Loss, $10,000, with $3,200 insurance.

Obituary.

Hector K. Dorsey died suddenly of apoplexy at his home in Newburg, N. Y., Feb. 24th. He was 71 years of age and for many years was a patternmaker at Clark & Kimball's foundry in hat city.

Malcolm McNeal, aged 81, died at his residence in Millville, Pa., February 6th. He was an old foundryman and a brother of John McNeal who operated the foundries in Millville and later on at Burlington.

Henry Newman, a well-known temperance advocate and reformer of Jersey City, died Feb. 4 at the Newman Mission in that city. He was also the founder of the Foundry Mission in that city and his labors among foundrymen were well known.

Abraham LaTourette, a former well-known resident of Waterloo, N. Y., died at Chattanooga, Tenn. recently. He carried on the foundry business at Waterloo, going from there to Marion, Ohio, and later on to Chattanooga, where he still continued the business. He was 75 years of age.

A World's Fair Treasure.

THE World's Fair was certainly an exposition of all that was best in the way of nineteenth century enterprise and contained evidences of what the culture, intelligence and skill of the world's most famous artists and artisians could accomplish in their respective lines. It is therefore most fitting that the history or illustrated memorial of the great gathering of nations by Chicago's lake should be in all respects everything that modern art and skill could make it, and that in style, contents, make up and typographical excellence it should be a typical representation of what the best talent in that line could do. Numbers eight, nine and ten of "Bancroft's Book of The Fair" are just out and are perfect marvels of beauty as showing the possibilities of the camera and half-tone engraving process to reproduce exterior and interior views in all their

Numbers eight and nine are largely devoted to machinery, and the large pages of the book enable correspondingly large cuts to be used, which, from the fine quality of the paper and the good workmanship, show to excellent advantage. For example, the largest engine on exhibition—the Allis—is represented by a picture nine and one-half by eleven and one-half inches, and other machines and machinery on a correspondingly large scale, several of the engravings being full page. The "Entrance to Machinery Hall" is a remarkably fine picture, as well as the view of the central aisle in that building. Number ten is devoted almost entirely to the Agricultural Building. Canada comes first, and is given a good deal of prominence. All the nations are included. This number has many fine illustrations, notably one of the grand Basin and Court of Honor, the Columbus Arch in the Peristyle and the Administration Day on Chicago day. But amongst so many meritorious views, it seems hardly fair to select any as best. It is difficult to say who will be most interested in turning over the pages of the "Book"—those who did not visit the Fair and who find portrayed the principal features of interest, or those who did visit it and see again these familiar features. As we have previously intimated, the paper is of a superior quality; the type is large and distinct, making it a pleasure to read the text.

Calumet Electric Street R. R., at Burnside Crossing, have put in a brass foundry and are going to do their iron work.

Our Chicago Letter.

(*Special to* THE FOUNDRY.)

Chicago shows a slight improvement in the foundry line. Spring is opening with the usual labor troubles in almost all branches of trade and it is hardly probable that the foundries of this city will escape. Of all the evils that exist, the pulling and hauling between the employer and employee is the worst, and as great as it is, there has never been any successful attempt to remedy it. If the present method of settlement (that of strike) is continued the wage question will never be adjusted. As the case now stands it is a continual see-saw. When the molders have the advantage they ask for an advance, and when the employers have it their way they ask for a reduction, and as a general thing a strike is the result in both instances, With things in this state, if a firm takes a contract they are in constant fear from the time they take it until they have it finished. The men never stop to consider whether the firm is making any money or not, their object is to get what they ask for. Consi leration should be given to a man that has his money invested. If a man has capital invested in a foundry it is no more than right that he should receive more than the man who only invests his labor. On the other hand it is nothing more than justice that a man should demand and receive a fair days' wages without fighting for it. The proper way to settle this is to have congress take hold and make laws to govern it. Congress would not be justified in saying what wages should be paid for certain classes of work or what price a man should receive for his labor, but they could regulate the hours of work and make laws wherein all differences could be settled. It might not be out of place to make it obligatory for the employer and employee to enter into a contract for one year and put a penalty on either that would violate it. The courts could could then be resorted to, and strikes become a thing of the past. An agreement of this kind could be entered into once a year, each could then make propositions to the other, and if any differences, they could be adjusted according

to law. After the schedule once adopted all parties could look forward to a year free from strikes and dissentions of all kinds. By this method, to bring about good results, both the employer and employee must be made amenable to the law.

Dawson Bros., 199 to 205 N. Halstead St., expect to start in full this month.

A. Bolter & Son, Belden Ave. and Ward St., report business somewhat improved.

Turner & Dickinson are getting things in readiness to start their new works at Hansen Park.

Cribben & Sexton have started up.

The Chicago Stove Works will start this month.

Cleveland & Co., proprietors of the Atlas Foundry, at Erie and Kingsbury streets are quite busy.

Lake Shore Foundry report business fair.

Vanderpool & Co., at 503 W. 22nd St. are running four days a week.

Fraser & Chalmer's are quite busy.

Chicago Architectural Iron Works, at 108 N. Oakley avenue are quite busy.

Winslow Bros. are running very slow.

Central Foundry Co., 15 S. Canal, have quite a number of large orders and are quite busy.

Western Electric Co. have put in a new Whiting cupola.

The Chicago Sugar Refining Co., at Beach and Taylor streets, have put in a brass foundry and are going to do all their own work.

The Gates Iron Works has purchased the plant of the Chicago Iron Works, at the southeast corner of Willow street and Hawthorne Ave., from Rockwell King, receiver, for $25,000. The ground fronts 300 feet on Willow street and 250 on Hawthorne avenue. The plant comprises a large brick factory, 150x200 feet, with pattern lofts, traveling cranes, etc. There are also large blacksmith and wood-working shops and also a large number of patterns of the most modern mining machinery. The plant is equipped with about $60,000 worth of machinery. In addition to this there is a valuable lease on the ground running from twenty-five years at about $90.00 a year taxes and assessments. The Gates Iron works has been located at No. 50 South Clinton street for 53 years. It will operate both plants, and next spring will build large shops and a foundry on the grounds just purchased and move the Clinton street establishment to the one just acquired. The Gates Iron Works makes a specialty of mining and milling machinery, and ships its product to the mining districts of this country, Mexico, South America, Africa, Australia and all the English Colonies.

H. S. V.

Our Cincinnati Letter.

(*Special to* THE FOUNDRY.)

The foundry business in this locality, like the rest of the country, continues extremely dull with a slight tendency to improve. Hoffenghoff & Lowe Co. have a 300 ton contract for the addition to the Cincinnati Gas Works; floor plates, mouth pieces, hydraulic main connections, etc. The bidding on this work by the foundries here was very low; each one thinking their bid the rock bottom price, but the Hoffenghoff & Lowe Co. got the contract and it is safe to say they will not use a large amount of charcoal cold blast iron in it at the figure they have taken it at.

There was a report to the effect that they had sublet the work to a Chattanooga firm but this proved incorrect.

The Addyston Pipe & Steel Co's plants at Addyston and Newport are running full time and nearly full handed, with a pet laid off occasionally for a week or so. In the molding floor department at Addyston they have a large contract from an eastern firm for some heavy kettles (11 tons). They are turning out these castings with the excellence for which this firm is noted.

The Resor Stove Foundry Co. has been closed down since the holidays with a prospect of starting up soon.

The large modern plant of the Eureka Foundry Co. are running three and four heats per week and are ready for the spring rush should it come. This shop has a 20 ton Yale & Towne steam crane

with three sets of reversing engines for hoisting, running the trolley back and forth on the jib, revolving it around. It is undoubtedly the finest foundry jib crane in this locality. Small cores can set with it with the same nicety that they are handled by hand cranes.

The G. A. Gray's model little foundry has started up again nearly full handed. It is the intention of this firm to try and introduce the piece system as practiced by the Niles Tool Works at Hamilton.

The old established Mowry Car Wheel Co. are running full time.

The Queen City Foundry Co. are running three heats per week with prospects of improving shortly.

The situation here is that parties having contracts to place are holding off in hopes of further decline in iron. This has the effect of making poor business worse. If iron should take a decided upward turn the parties would hasten to place their contracts before a farther advance. This, of course, would have the effect of making good business better which is a consumation most devoutly to be wished. T. H. R.

Riehle Bros. Testing Machine Co., of Philadelphia. have closed contract with the patentees for the exclusive manufacture of the Riehle-Anderson Patent Track Jack. This jack has been endorsed by some of the leading practical railroad men in the country, and will, no doubt, meet with large sale.

NOTICE.

Advertisements inserted under this head for 25 cents a line each insertion.

CHEMIST—A young man thoroughly familiar with the chemistry and analysis of pig iron, etc., desires position; can furnish best of references. Address, A. P. Bjerregaard, 47 North Willow street, Montclair, N. J.

FOUNDRY FOREMAN of 20 years' experience wants position; thoroughly posted on light and heavy work; distance or locality no object. Address "J. F.," this office.

WANTED—A position as foreman by experienced patternmaker; used to general machine, engine, mining and sugar machinery; South preferred; best of references. Address, L. H. K., care "Foundry."

WANTED—A good practical foundryman with some capital to invest in an established business as partner. Other partner engaged in boiler-making business that uses a great many castings. John T. this office.

FOR SALE.—Foundry, jobbing and repair shop; in a lively, growing city with a good country. Address, Wm. Engbring, Cedarburg, Wis.

Making Cast Iron Mortars.

THE making of cast iron mortars for the purpose of defending the coasts of the United States, is a matter of national importance, but to no one is the process so full of interest as the iron founder.

In a previous issue we referred briefly to this subject, but present herewith to our readers a more extended and illustrated statement of the process of molding, casting, testing, etc., for which we are indebted to a pamphlet recently published by the Builders' Iron Foundry, of Providence, R. I., who have made a great many for the United States government. One remarkable thing about this widely known manufacturing establishment, that we feel it our duty to comment upon, is the fact of their so generously preparing—and for free distribution—a full description of the whole process. Usually establishments doing work of this class consider it to their best interest to surround every point with the greatest secrecy, but here we have a concern large and well known, who not only welcome visitors and show them through their works, explaining everything, but publish a neat little book describing it as well as possible for the benefit of those who are interested and cannot pay them a personal visit.

Specifications Governing the Manufacture of Cast Iron Bodies for 12-Inch Breech-Loading Mortars, Hooped With Steel.

Metal and General Conditions for Casting.—The castings for these mortar bodies shall be of charcoal pig, of the standard quality required for gun iron. The mixtures of metal suitable for the purpose to be first determined by the test of trial cylinders, at the expense of the manufacturers, unless mixtures already known to the Department are employed. No change in the mixtures once established will be made unless with the approval of the Department, and subject to such tests as may be required. The casting shall be made breech down, with a straight, cylindrical bore. The exterior, inclusive of the surplus metal at the bottom, shall be cylindrical with a diameter not less than

33.5 inches from the base up to and including the place of maximum diameter of the body when finished; the upper portion and sinking head may be slighttly tapered towards the top. The weight of the sinking head above the muzzle specimen slice shall be at least one-fifth of the total weight of the whole casting. A surplus length of at least 5 inches below the breech specimen slice shall be cast. In pouring the metal into the mold the flow must be continuous and uniform, and any evolution of gas from the mold or core arbor through the metal may be sufficient cause for rejecting the casting.

Cooling From the Interior.—To obtain the prescribed initial compression, the casting shall be cooled from the interior by a current of water, without formation of steam, the portion of the core-barrel through which water circulates extending through the casting from top to bottom. When water is admitted to the bore, after removal of the core-barrel, its outlet should be above the top of the casting, the exterior at the same time being kept hot by a fire built around the flask within the casting pit, all according to the usual Rodman process, except as may be modified herein, the whole operation to be regulated in such manner as to secure a gradual and uniform cooling that shall leave the casting free from irregular or excessive internal strains. The manufacturers must apply the necessary apparatus for accurately determining the rate of flow and the temperature of the water in cooling, and as far as practicable the temperature of the casting pit.

Test Specimens and Physical Qualities Required.—The test specimens shown on the accompanying drawing H, will be required from each casting. The tensile strength of the metal must average at each end at least 30,000 pounds per square inch; no specimen to be over 37,000 pounds per square inch; but one specimen from each end may be as low as 28,000 pounds per square inch. The long extension specimens will not be considered in making up these averages, but must show a good elongation and an ultimate strength, for each specimen, of not less than 24,000 pounds. The density of the metal must be such as to indicate that the metal has been sufficiently refined but not carried so high as to impair the other qualities. The hardness may vary between 13.5 and 18.5, as determined by the usual method employed by the Department. Specimen cylinders one inch in diameter by one inch long must be taken contiguous to each of the tenacity specimens Nos. 3, 4 and 5, from both muzzle and breach specimen slices, and tested for density and hardness. The physical qualities, as determined by all the tests, should be generally uniform for the same casting.

Initial Tension Rings.—The two slices from which test specimens and the three initial tension rings are to be taken will be cut from the casting and cleaned up on the interior to 12 inches diameter and on the exterior to 30 inches diameter for the width of the ring; the initial tension rings will then be detached, the cut parallel to the axis being the last. Median circumferences will be scored on the rings and will be measured by the inspector before the cut parallel to the axis is commenced and after the rings are detached. A comparison of the measurements of these circumferences made before and after the rings are detached must show expansion of the inside rings and contraction of the outside ring, showing an initial compression at the bore of about 5,000 to 9,000 pounds per square inch at the breech and of about 5,000 to 13,000 pounds per square inch at the muzzle.* The test specimens required will then be cut out and finished. The initial tension rings and all test specimens shall be prepared as soon as practicable after the casting is made, and both muzzle and breech specimen slices shall be detached without delaying for work in shaping the body.

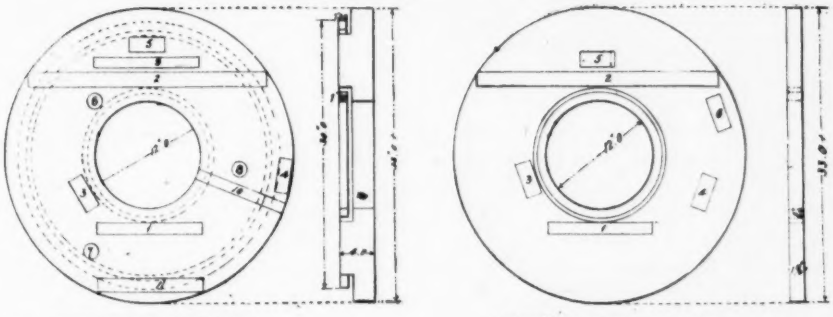
Condition of Material when Delivered.—The castings must be sound, free from cavities, blow holes, soft spots or flaws, and only tough, reliable metal, not hard or brittle, fully up to the standard of gun iron, will be accepted; all rough bored and turned surfaces must be straight and true without eccentricity.

*The initial compression at the bore will be determined for the breech and muzzle respectively by multiplying the expansion per inch of the inside rings by the constant factor 18,000,000.

H.

FORM AND POSITION OF TEST-SPECIMENS
FROM
CAST-IRON BODIES FOR 12-INCH B. L. MORTARS.

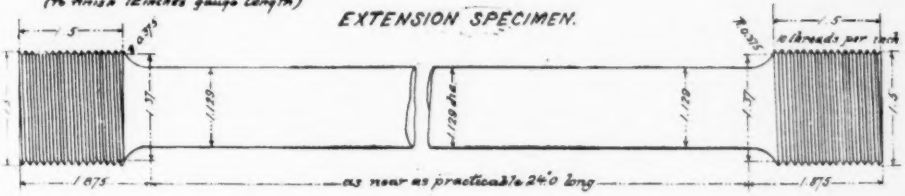
Scale 1½ inch = 1 foot.



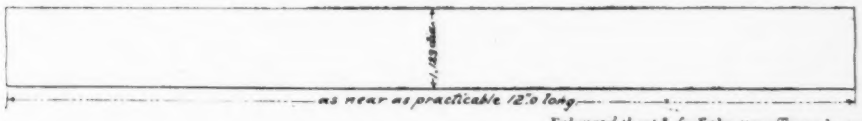
No 1 SPECIMENS FROM BREECH.
No 2 Tangential Compression
" 3 4 & 5 Tangential Extension
" 6 7 & 8 Longitudinal Tenacity
No 9 Tangential Compression
" 10 Radial "
" 11 Tangential Extension
(to Ainish 12 inches gauge length)

No 1 SPECIMENS FROM MUZZLE.
No 2 Tangential Compression.
" 3 4 & 5 Tangential Extension.
" 6 Tenacity

EXTENSION SPECIMEN.

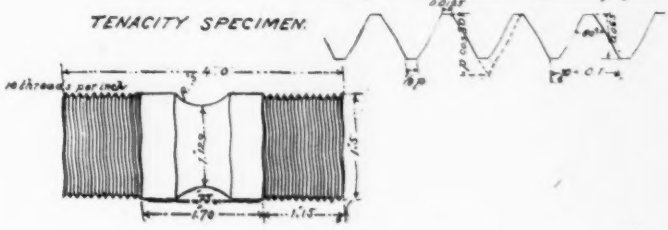


COMPRESSION SPECIMEN.



Enlarged thread for Extension & Tenacity specimens

TENACITY SPECIMEN.



Metal Used In Ordnance. Cast Iron.

The metal of guns made for service is subjected to tests to ascertain its hardness, specific gravity, and tensile strength.

General law.—It is a law of the molecular aggregation of crystalline solids, that when their particles consolidate under the influence of heat in motion, their crystals arrange and group themselves with their principal axis in lines perpendicular to the cooling and heating surfaces of the solids; that is, in the lines of direction of the heat-wave in motion, which is the direction of least pressure within the mass; and this is true, whether in the case of heat passing from a previously fused solid in the act of cooling and crystallizing on consolidation, or of a solid not having a crystalline structure, but capable of assuming one upon its temperature being sufficiently raised, by heat applied to its external surfaces, and so passing into it.

Molecular constitution of cannon metals.—The metals used in gun construction are crystallizing bodies, which in consolidating obey more or less perfectly, according to their conditions, this law; so that in castings of these metals, the planes of crystallization group themselves perpendicularly to the surfaces of external contour; that is, in the directions in which the heat of the fluid metal has passed outwards from the body in cooling and solidifying. Because the crystals of these metals are always small and are never very well pronounced, these directions are seldom very apparent to the eye, but they are not the less real.

Variation of density and tenacity.—An increase of density is a consequence which invariably follows the rapid cooling of cast iron, and as a general rule, the tenacity is increased by the same means. The density and tenacity usually vary in the same order. It appears that the tenacity generally increases quite uniformly with the density, until the latter ascends to some given point; after which an increased density is accompanied by a diminished tenacity.

The turning point of density at which the best qualities of gun iron attain their maximum tenacity appear to be about 7.30. At this point of density, or near it, whether in proof bars or gun heads, the tenacity is greatest.

As the density of iron is increased, its liquidity when melted is diminished. This causes it to congeal quickly, and to form cavities in the interior of the castings.

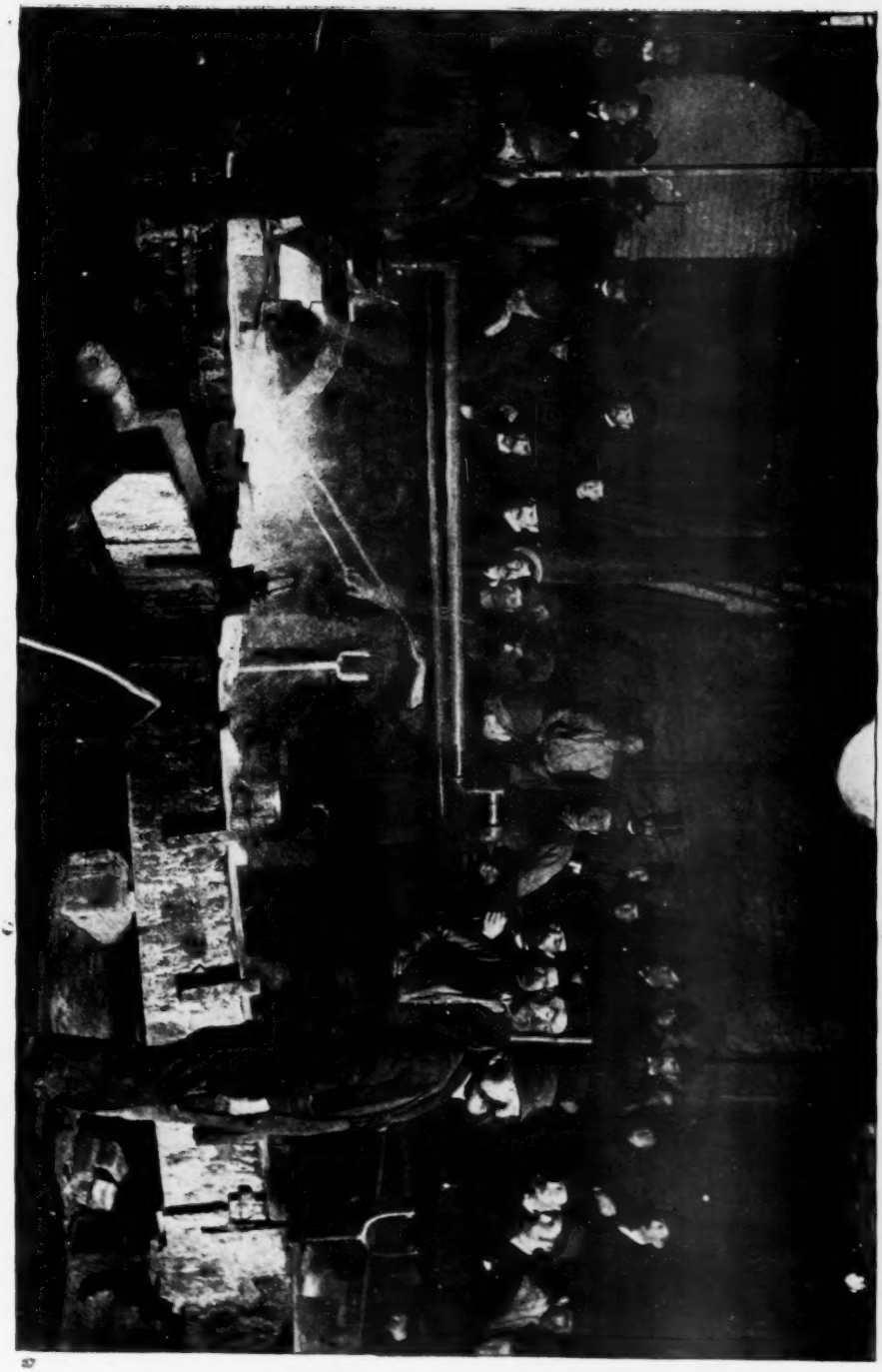
High iron.—The condition of the iron at casting is said to be "too high" when the process of decarbonization has been carried too far.

Effects of irregular cooling of castings.—The contraction of cast iron in becoming solid introduces strains into the mass of consolidation of one portion of the casting before another. When a large gun is cast solid and the metal cools in the ordinary way, the external portions solidify long before the interior has ceased to be liquid, and the process of solidification is propagated, as it were, in parallel layers from the outside to the center of the mass. When the first layer or thickness of solid crust has formed on the exterior it forms a complete arch all around, so that the contraction between fluidity and solidification of each subsequent layer is accommodated by portions of matter withdrawn radially from the interior towards the still cooling exterior, that is to say, from a smaller towards a larger circumference. The final effect of this propagated to the center of the mass is twofold:

1st. To produce a violent state of internal tension in the particles of the metal in radial lines from the axis of the gun inward as a cylinder, tending to tear away the external portions of the mass from the internal nucleus.

2d. To produce about the center or along the axis a line of weakness, and one in which the texture of the metal is soft, porous, and of extremely low specific gravity.

The effect of this unequal contraction may be so great as to crack the interior metal of cast iron cannon even before it has been subjected to the force of gunpowder, and large masses of iron which have been cooled very rapidly by casting them in iron molds have been known to split open longitudinally from no other cause than the enormous strains to which they are subjected.



The Rodman plan.—All heavy cast iron cannon manufactured for the land service of the United States are cast upon the Rodman plan. This plan consists in cooling the casting from the interior, and is effected by the insertion of a hollow core in the center of the mold cavity, through which a stream of water or current of air circulates, carrying off the internal heat. The radiation of heat from the exterior of the casting is meanwhile retarded by keeping the outside of the flask hot with surrounding fires. Extensive trials have demonstrated the superiority of cannon cast on this plan over those which are cast solid.

Description of the Process of Manufacturing Cast Iron Cannon.

The several operations in the foundry are *molding, casting, and cooling.*

Molding.—Molding is the process by which a cavity or mold of the form of the gun is obtained by imbedding a model or pattern in sand, and then withdrawing it.

The *pattern* is usually constructed of wood made in as many sections and parts as may be necessary to admit of its being easily withdrawn from the mold.

The *core barrel* or *arbor* consists of a water-tight cast iron tube made sufficiently thick to withstand the pressure of the metal in the mold. Its length and diameter are such as to leave a sufficient surplus of metal in the bore of the gun to secure a good finish. It is constructed with a slight taper to facilitate its withdrawal after the casting. The lower end is tapered off and is fitted with several iron pins for securing the extremity of the rope, which is used as wrapping material in the preparation of the core; the exterior of the barrel is fluted from top to bottom to allow the escape of the gases generated by its combustion. Before being used, the core barrel is always subjected to a powerful water pressure to test its soundness. To prepare the core for casting, journals are fitted to its extremities. It is then placed in a horizontal position upon an iron truck, supported by the journals resting in bearings and turned by a crank attached to one of the journals.

(TO BE CONTINUED.)

Chemical and Physical Analysis.

MANY of our readers have doubtless been greatly interested in the papers on the chemistry of iron by Messrs. Wheeler and Keep which have lately appeared in THE FOUNDRY and which are referred to elsewhere.

As the subject is an important one we devote a large amount of space in this issue to it. The following is a letter appearing in the "Iron Age" of March 1st, from Mr. Wm. Molin, of New York, criticising some of Mr. Keep's statements in his paper before the Philadelphia Foundrymen's Association.

There seems to be an impression among those who were present durthe reading of W. J. Keep's paper ing on the subject of "Foundry Chemistry" at the February meeting of the Foundrymen's Association that the statements made were antagonistic to the use of chemical tests in foundry practice. Whatever statements may emanate from so eminent an authority on this subject are likely to cary great great weight, and it would certainly be somewhat of a surprise if, after all the investigations made by Mr. Keep, he should finally come to the conclusion that the old rule of thumb practice were the only one practicable in the foundry shops.

It would be very strange, indeed, if this should be the result arrived at by Mr. Keep after all his valuable investigations, which have served others as an incentive to work to the same direction, but whose conclusions have been very different. If Mr. Keep's opinions should really be that there should be little to gain for the foundrymen by a more general use of chemical tests, it is evident that his investigations were not made with a view of applying the results in foundry practice, and it is still more evident that Mr. Keep himself has not made any practical use of them in his own shop.

Mr. Keep advises the foundrymen that no other element than the silicon is worth looking for in irons, under the supposition that ordinary foundry irons are in other respects all that can be desired. This statement may apply to the

particular irons going into mixtures for stoves in Detroit, but can certainly not be applied to irons for more delicate work of many kinds requiring highest possible strength in conjunction with other properties, for which the irons should be intelligently selected. But even for stoves it has been found more advantageous to guard against mistakes in making the mixtures, at least in this section of the country, where the market is overrun with a large variety of irons, the compositions of which change considerable from time to time. The superintendent of a large stove foundry here informs me that since they employed the services of a chemist, some four years since, they have not made one pound of iron that was not suitable for their work; that they have found that it pays to keep a chemist on the premises; and that they cannot afford to dispense with his services. The same has been the experience of others who have abandoned the rule of thumb practice—few as they are as yet—and who compute their mixtures on the basis of chemical analysis. Such foundrymen as are experiencing difficulty in using up their scrap piles, or who find themselves in "hot water" otherwise, I would refer to S. Bolland's book. "The Founder's Supplement," p. 22, where they will find some valuable advice.

Mr. Keep says: "Any marketable iron can be used if properly mixed with other marketable irons." If this statement be intended to belittle the value of analysis, it does just the reverse. For how could the irons be mixed properly without acquaintance with their merits—that is to say, with their chemical composition? And how can the quality of the fuel be ascertained unless by labratory tests? Mr. Keep says further: "For economic reasons he (the founder) ought to use all the scrap he can, and he can get no satisfactory analysis of this and pig iron will not run uniform." Here I agree with Mr. Keep. As a rule it is, for certain and good reasons, of little use to analyze scrap. Cast iron scrap is said to be of four distinct grades, each requiring different doses, from 0.5 to 2 per cent. of silicon, in order to obtain the best results. It should therefore be assorted when offered for sale, as each grade has very different values to the founder. As Mr. Keep admits that pig iron does not run uniform, this ought to be a strong reason for having them analyzed.

Mr. Keep states that "silicon as it exists in one kind of pig iron will be much more effective than that in another brand, and by using one 2 per cent. silicon brand will do more than 2.5 per cent. from another brand." In his valuable pamphlet on "The Influence of Silicon in Cast Iron," Mr. Keep asserts that "irons receive in the blast furnace certain tendencies which will exert their influence in the most unexpected ways." If these two statements are correct, and I have had frequent opportunities to convince myself that they are, how much more reason is there to ascertain what causes these tendencies, which are dependent upon the amounts of the other usual elements to be found in irons, especially those of combined carbon and manganese. If an iron carrying only 2 per cent. of silicon is more effectual than another carrying 2.5 of the same element, there must be some good reasons for it, which will invariably be revealed by analysis.

Mr. Keep says that "practically the grayness of pig iron or of a casting is dependent upon the per cent. of silicon present, and if it contains enough silicon to make it grey its combined carbon will be low." To my knowledge Mr. Keep is the only metallurgist who ascribes the grey fracture of pig iron to the silicon. As a rule, the fracture of irons running over 3.5 per cent. of silicon becomes lighter somewhat in proportion to the increase of the silicon and decrease of the graphitic carbon. The influence of the graphitic carbon upon the color of the fracture is best shown from the fact that castings of a dark color are made in the cupola (regularly, I believe, at the place I have in mind) from materials containing much less 0.5 per cent. silicon and 0.1 per cent. carbon, which after remelting contains 4 per cent. carbon and about the same per cent. of silicon as the charge.

Mr. Keep says that "carbon in pig iron will vary in total amount, but we

will not pay any more for a pig if it is high in carbon." The rule of thumb practice in "grading" foundry irons is based on the supposed carbon contents, and as ordinary foundry irons, regardless of "grade," contains enough carbon for all purposes, the difference in price paid for No. 1 and No. 2 irons is often just that much premium paid to the blast furnacemen without receiving the benefit of any corresponding value in quality of iron. It would be interesting to know what is really (and honestly) meant by a "standard" brand of iron, and I defy anyone to give a satisfactory definition of this precious product. It should be noticed that Mr. Keep himself states that "any marketable iron can be used if properly mixed with other marketable irons." If any marketable irons will do for stove work, they will certainly do for less particular work also. Our foundrymen have been long complaining that there is little or no profit in the foundry business, and it is a wonder to me that there can be any profit at all coming to such founders as as are still clinging to their pet "grading" by fracture, and who are paying premiums on irons simply because they have an open grain, which has proven to be a "delusion and a snare." Blast furnacemen, in trying to show that the rule of thumb method in grading irons is not quite so arbitrary as supposed to be, have succeeded in proving just the reverse, and that analysis is the only reliable guide when purchasing irons. When a blast furnaceman has the courage to admit in print that his precious No. 1 and No 2 carry the same amounts of silicon as his No. 3, there is no more "telling" evidence needed for proving the "fake" that is practiced upon unsuspecting founders. And when he further states that the three grades are obtained in the same casts he also admits that they stand him at the same cost of manufacture.

An amusing statement of Mr. Keep is the one that "chemical analysis is too slow and too expensive for a foundry making casts every day." This statement is the more amusing as it comes from a member of a craft one member of which recently said that "though all other branches of the iron and steel business have been revolutionized, the foundry business is plodding along in the same old rut, and is governed by the rule of cut and try." And he could not see that there had been any improvement in it for the past 40 years. These are pretty strong statements, coming, as they do, from an "old-timer." As to the expenses for chemists' services, I would say that I know of some chemical "Nancy Hanks" born and bred in our own United States who assure me that they are able to rattle off some 50 to 75 determinations per day. There is certainly nothing slow about these artists, and their services can be had at incredibly low figures. These champions, however, are not the ones that would be of any use to the founder. Considering the number of determinations really needed for a foundry, one expert will suffice for 25 ordinary foundry shops.

Mr. Keep says: "Chemists often say, what is perfectly true, that neither foundrymen nor furnacemen know what chemical constitution is required to make the best castings." Nobody has disputed this fact. If the furnacemen and founders do not know anything about it by this time, it shows they have neglected to follow up the literature on this subject and that the columns of *The Iron Age* have not been perused as they should be. And it is not necessary that they should have any knowledge upon this subject. Entrust the beginning to experts, and by degrees the little metallurgical knowledge required will be picked up the foundryman, and he will soon be able to judge for himself what irons will fill the bill at the least cost. Any furnace will in the near future have to furnish the per cent. of silicon in their irons, and this can be easily done within the limits of 0.5 per cent.

It is well known that wrought iron and steel have of late been largely substituted for cast iron for building purposes. In his work, "Materials of Construction." Thurston states that "cast iron columns are economical in cost of manufactnre and fitting, and are more durable when exposed to the weather than are columns of wrought iron," Yet

engineers and architects tell me that they prefer using wrought iron or steel, because cast iron cannot be relied upon. Now, there need be no more unreliability about cast iron than about wrought iron and steel. As, however, engineers seem to be less familiar with the real capabilities of cast iron than with those of wrought iron and steel, the manufacturers of the former products have not been "kept up to the scratch," by being compelled, because of rigid specifications, to aim at the be best results. By aiming at a minimum tensile strength of 25,000 pounds per square inch the probability is that better results still will be obtained; and I know that such results are obtained regularly at a foundry where the rule of thumb practice does not prevail and where they are able to use up all the scrap they care to.

Any manufacturer who neglects to avail himself of the aid of science, where applicable, will, sooner or later, find himself left behind; and in no branch of industry is this more apparent than in our great iron industry, the immense strides of which are in a large measure due to scientific research and prompt application of the results.

WM. MOLIN.

To the foregoing Mr Keep has replied as following in a letter to the "Iron Age".

MR. EDITOR:

HE seems to represent a class of chemists who appear to think that there is no avenue for scientific research except through a chemical labratory, and that all that is done without a chemical formula is "rule of thumb."

One that is familiar with metalurgical chemistry and at the same time a mechanical engineer, will naturally use autographic mechanical methods, especially when he finds that chemical analysis will not account for facts which he must understand.

The specification for cast iron structures is strength, deflection, shrinkage, chill and hardness. These are purely physical qualities and the engineer does not care about composition so long as the physical quality is satisfactory. Those who say that the physical appearance of a pig of iron will not indicate its chemical composition, and that therefore it must be sold by analysis, forget that the engineer cannot sell his casting by analysis. Reverse what they say and it is equally true. The chemical composition of cast iron will not indicate its physical properties. Conditions attending the working of the furnace or state of the pig bed will affect the physical quality of the pig iron and this will be imparted to the casting. It is wise to learn what the iron purchased contains and to keep sulphur low, for its presence indicates that it was made under conditions which will probably cause iron to chill.

It is wise to have a general idea about the silicon contents, for the correct amount must be in the casting, and if not in the pig it must be added.

Let it be understood that all I say or have ever said pertains to ordinary gray iron castings. Makers of car wheels, chilled rolls, malleable iron, or of any special process work, must not think that I will attempt to make suggestions to them.

The right amount ot silicon will control the grayness of pig iron or of a casting and any chemist familiar with foundry iron knows this. Mr. Molin should know that irons that contain higher than 3.50 per cent. silicon are no longer foundry irons but are vehicles for imparting silicon, that is, grayness to other iron.

It seems strange that I should be considered antagonistic to the work of the broad-minded chemist. This position would be very ungenerous to such careful analysis as Dr. Mabery and Messrs. Fleming, Orton, Vorse, Morse and Ellis and the chemists of many iron companies for their gratuitous work all along the line of our investigations, and we have little sympathy with the endeavor to show the speed and cheapness of chemical work, such as Mr. Molin says can be learned in a short time by any intelligent office boy or clerk.

Since Mr. Molin quotes some of my written statements to support his statements, let me quote from the November number of THE FOUNDRY to show my position.

"Intelligent mixing of irons cannot be accomplished without the aid of chemistry, and conclusions must be reached by the united work of chemistry and physical experiment.

We do not by any means wish to be understood as saying one word against chemical analysis.

If a man with a thorough chemical education would learn to look at general tendencies and not hold so closely to four figures of decimals and accept the results of late research, he could adapt himself to practical foundry work and would be of great use. He would soon leave his laboratory and become the practical leader and would only go back occasionally to solve some problem that needed new light.

We cannot have too much respect for chemistry. Practical research could do nothing without it, but after general conclusions are reached, then to be of use the chemist must be the practical metalurgist." In the discussion in Philadelphia. Mr. Outerbridge deals practicably with the most difficult feature in foundry practice, viz.. the variability in the composition of pig and scrap. He says: "Do not depend on one, two or three different irons, but make a melt of a considerable number of irons which have been previously analyzed. Now, as soon as you begin to increase the number of irons forming your melt, you begin to decrease the possibility of variation." And he might have added, in making a change never change at one time more than one iron in a mixture. This illustrates what we mean by the chemist becoming the practical man. These business-like ways of avoiding a difficulty are best.

In the latter part of Mr. Molin's communication he happens to step outside of the door of his laboratory and talks of strength per square inch, and expresses the opinion that there need be no more unreliability about cast iron than about wrought iron or steel. Perhaps he may find that the mechanical engineer is right and that an analysis by Mr. Molin would not keep out slag or a part of the mold or permit a blow-hole.

On Feb. 23 the test cases of the iron of the Michigan Stove Company were as follows:

The depth of chill was .02 or practically none. The shrinkage was .131. If a more satisfactory test of gray iron has ever been made I am not aware of it. The strength of bar No. 1 would figure 4240 pounds per square inch for a bar 1x1x12 inches.

If chemical analysis will give any explanation for the physical properties of iron with this remarkable strength and low shrinkage I would like to see it. I report this to ask that those chemists who think that they can formulate a prescription for iron of any physicial character may state what the chemical composition of this iron should be. It is made with ordinary coke, in an ordinary cupola, from ordinary cheap foundry pig, and one very ordinary silicon iron, and to prevent any hesitation on their part we will add that there is not any aluminum in this mixture.

I understand that at this week's meeting of the Western Foundrymen's Association, Mr. Wheeler is to reply to my paper, and I will announce that I will either at the meeting of the Foundrymen's Association, in Philadelphia, or in your columns during the first part of April, notice what he and others may say on this subject.

W. J. KEEP.

Detroit, Mich.

1/2x1/2x12 INCHES.	DEAD LOAD.		1/2x1/2x12 INCHES.	IMPACT.		
	STRENGTH.	DEF.		STRENGTH.	DEF.	SET.
Test Bar No. 1,.....	530 lbs.	.27	Test Bar No. 4,.....	457 lbs.	.24	.02
" " " 2,.....	490 "	.26	" " " 5,.....	525 "	.28	.03
" " " 3,.....	505 "	.22				
Average, 3 Bars,	508	.26 2/3	Average, 2 Bars.	491	.26	.02